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# Pharmaceutical Interrogations

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A LIST OF CLASSIFIED QUESTIONS UPON SUBJECTS PERTAINING TO  
PHARMACY, ACCOMPANIED BY REFERENCES TO  
STANDARD AUTHORITIES.

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FOR THE USE OF STUDENTS

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# INTRODUCTION.

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It is not the object of the following exercises to afford a "short cut" method of preparation for Board examinations (a method always hurtful to those who attempt it), but by means of a classified list of questions to stimulate the regular and systematic study of subjects which are frequently pursued irregularly and unsystematically. One advantage of this method is that it may be carried on under circumstances which would render more consecutive study impracticable. Perhaps but few days elapse, even in the busiest stores, when there are not moments which might well be employed in the investigation of some practical question, provided the question is presented. Thus, by the utilization of time, which might otherwise be spent in profitless conversation, the student may develop a capacity for independent investigation and lay the foundation for a thorough and lasting education in pharmacy. A desire to encourage such a disposition among druggists' clerks and students of pharmacy has been the chief incentive to the preparation of the following pages.

The questions have been derived from direct consultation of the texts to which reference is made, though doubtless many have appeared in previously printed lists. This could hardly have been otherwise, and no apology is offered for the fact.

In the selection of the questions the following considerations have been kept steadily in view: First, That knowledge is of the most value when gained as the result of patient and intelligently directed search for it. Second, that the U. S. Pharmacopœia is, or ought to be, the basis of dispensing pharmacy in America. Third, That the questions should be mainly of such a character that they may be solved by the independent experiments of the student or by reference to the authorities which ought to have a place in every pharmacist's library.

That the work may serve the purpose for which it was intended, the author makes the following suggestions to the student:

First, go through the lists and check off such questions as you are sure you can answer correctly. Indicate by a different mark the ones you are doubtful about and leave the remaining ones unmarked. Next, with the aid of the proper reference books,

look up successively the questions you are doubtful about until you have mastered them. When these are finished, take up the remainder, and so on until the list is exhausted.

In looking up the references, do not aim to cover merely the precise point of the question. Read broadly and liberally. Aim at getting all the information possible out of every subject.

Do not "eram." One subject mastered and made a durable part of your knowledge is worth more than all the merely memorized facts that your recollection can hold.

Never ask anyone a question which you can determine by your own investigation. Whenever possible, find the answer by means of an experiment.

If you do not have access to the necessary reference books, buy them. The pharmacist who does not take pride enough in his profession to provide himself with the standard works upon it had better seek some other calling.

Much advantage may be derived by several students combining to form a club and performing the work in company. In this way the subject not only becomes more interesting, but the stock of available reference books may be materially enlarged.

Make constant use of the blank pages for noting items of interest met with in your researches, and for recording such data as are liable to escape the recollection if not thus preserved.

Lastly, and most important of all, pursue your studies regularly, constantly and systematically.

In conclusion, the author desires to express his obligations to Prof. Geo. B. Kauffman, of the Ohio State University, for kind suggestions and assistance rendered in the preparation of this work.

Scio, Ohio, Nov., 1895.

# PART I.

## THEORY AND PRACTICE OF PHARMACY.

REFERENCES :— Remington's Practice of Pharmacy, Caspari's Treatise on Pharmacy, Coblentz's Manual of Pharmacy, Oldberg's Home Study in Pharmacy, The United States and National Dispensatories, and U. S. Pharmacopœia. See also a series of papers by eminent authors in the *Pharmaceutical Era* for 1895. Also National Institute of Pharmacy Lectures.

### GENERAL.

1. Define the science of Pharmacy, and name the several special branches of Natural Science which it includes.
2. How long has Pharmacy existed as a separate calling?
3. General Pharmacy is usually divided into what three principal branches or departments?
4. What is a Pharmacopœia? Name four of the most important. When did the last United States Pharmacopœia go into effect?
5. What is a Dispensatory? Name the three most important.

6. How many titles has an official substance? Define the use of each.

7. What is Metrology? What did it formerly include, and what is the present extent of the science?

8. What was the origin of the grain weight? What three systems of weight are in common use in Pharmacy?

9. Give the tables of Apothecaries' and Avoirdupois Weight?

10. How does Apothecaries' differ from the old Troy Weight?

11. What system of fluid measure is in common use in this country? What system is used in Great Britain? Give the table of U. S. Wine or Liquid Measure.

12. What unit is common to both Apothecaries' and Avoirdupois Weight? Is there a unit common to both Imperial and Wine Measure?

13. How many grains in an Avoirdupois ounce? In an Apothecaries' ounce? What is the weight in grains of a fluidounce of distilled water?

14. How many minims are in a fluidounce? How many in a fluidrachm? What system of

weights and measures is official in the present United States Pharmacopœia?

15. What is the fundamental unit of the Metric System from which all other units are derived? How was it obtained? From what languages are the prefixes taken? Learn the table of Metric Linear measure.

16. What is the value of the meter, decimeter, centimeter and millimeter in inches or fractions of an inch?

17. How is the primary unit of volume measure derived? Give the table. What is the value of the liter in Apothecaries' measure? Of the cubic centimeter?

18. What name is sometimes used for the cubic centimeter which shows its relation to the gram?

19. What is the primary unit of weight? How is it obtained? Repeat the table of metric weights.

20. What is the value of the kilogram in Apothecaries' Weight? What is its value in Avoirdupois Weight?

21. What is the value of the kilogram in Troy grains? What is the value of the milligram in Troy Weight?

22. What is the value of the Apothecaries' ounce in grams? What is the value of the Avoirdupois ounce in grams?

23. What is the value of the Apothecaries' drachm in grams? What is the value of the Troy grain in milligrams?

24. What is the value of the fluidounce in cubic centimeters? What is the value of the fluidrachm in cubic centimeters? What is the value of the cubic centimeter in minims?

25. What is a balance? How may balances be classified?

26. What are the requisites of a Single Beam Equal Arm Balance? How does the Analytical Balance differ from the ordinary Prescription Balance?

27. What is the principle of the Torsion Balance?

28. What rules should be observed in the operation and care of a fine balance?

29. Name the several forms of weights employed by pharmacists, and describe those which are most useful.



30. Name and describe the several varieties of vessels which are used for fluid measures.

31. What are the values in Apothecaries' measure of the common domestic measures, tumblerful, teacupful, wineglassful, tablespoonful, dessert-spoonful and teaspoonful?

32. What is the average number of drops in a fluidrachm? What circumstances influence the size of the drop?

33. Define Specific Gravity. In the practical determination of specific gravity what is always sought?

34. What is the standard of temperature adopted by the U. S. P.? Are there any exceptional cases?

35. Describe the following methods of taking the specific gravity of a solid, insoluble in, and heavier than water, (a) with the balance, (b) with the Specific Gravity Bottle, (c) with the Graduated Tube.

36. Describe the method of taking the specific gravity of substances soluble in water.

37. Describe the method of taking the specific gravity of a substance insoluble in, and lighter than water.

38. Describe the several forms of Hydrometers. What is the difference in the position of the first mark on instruments intended for liquids heavier, and on those for liquids lighter than water?

39. What is the usual form of alcoholometer?

40. What are Specific Gravity Beads, and how are they used? What is the Densimeter?

41. What is the form of hydrometer known as Fahrenheit's or Nicholson's?

42. What is Mohr's apparatus for specific gravity, and how is it used?

43. What is the Westphal Specific Gravity Balance, and how is it used?

44. What are the specific gravities of chloroform, ether, alcohol, glycerin, creosote, and spirit of nitrous ether?

45. Define Specific Volume. What are the relations of specific gravity and specific volume, and how may they be calculated from each other?

46. Describe the Specific Volume Bottle.

#### HEAT AND ITS PHARMACEUTICAL APPLICATIONS.

47. What is the modern theory of heat? Name the several kinds of fuel that may be used for phar-

maceutical purposes, and give their relative values.

48. Describe a form of pharmaceutical furnace.

49. Describe the common forms of alcohol or spirit lamps.

50. Describe the several forms of gasoline burners and kerosene stoves. What are the chief disadvantages of each?

51. What are the advantages of gas as a fuel? Give a description of the several forms of gas burners and their ranges of usefulness.

52. Describe the two chief kinds of Thermometers. What are the rules for converting Centigrade temperatures to Fahrenheit, and vice versa? Why is 32 added in the conversion?

53. Why should thermometers not be graduated as soon as made?

54. What are the boiling and freezing points, respectively, of mercury and alcohol?

55. What is a mouth Blow Pipe? Describe the several forms. Is the blast of air maintained by the lungs or by the muscles of the cheeks?

56. Name and define the several pharmaceutical processes which require the application of high temperatures.

57. For what purposes are Baths used? Describe the several kinds used in pharmaceutical processes.

58. The solution of a solid in a liquid has what effect upon the boiling point of the latter? What effect upon the freezing point?

59. What is Latent Heat? What is the number of heat units which are rendered latent in the conversion of water into steam?

60. What is Specific Heat? How is it measured?

61. In what two ways is steam used as a heating agent in pharmaceutical operations?

62. What is the effect of pressure upon the temperature of steam? What will be the temperature of steam under a pressure of 100 pounds to the square inch?

63. Define Evaporation and Distillation?

64. Of what use are melting and boiling points in determining the purity of substances? How are melting and boiling points practically determined?

65. How is the tension of vapors determined?

66. What is Ebullition? How does it differ from vaporization without ebullition?

67. State the several conditions which favor or retard vaporization. What effect has the shape of the vessel and agitation?

68. What is a Vacuum Apparatus? What effect has the removal of pressure upon the boiling point of liquids?

69. Describe the Alembic. Describe the several forms of the modern Retort.

70. How are flasks fitted for distillation? Describe the operations of bending, cutting and joining glass tubes.

71. Describe the several forms of receivers, adapters and safety tubes.

72. Describe the different forms of retort stands. What are the defects of the ordinary form?

73. What is Bumping, and how may it be prevented?

74. What is Liebig's Condenser?

75. What is the inverted or reflux condenser, and for what is it used?

76. Describe a common Pharmaceutical Still. What is Curtman's modification?

77. Describe the forms known as "Remington's," "Prentiss's" and "Rice's" Stills. State the important features of each?

78. Describe the process of Sublimation, and its object. How is it performed? What is the difference of manipulation required to obtain powder sublimates and cake sublimates?

79. Name some official substances which are obtained or purified through sublimation.

#### COMMUNUTION.

80. Define Desiccation. What are the effects of desiccation upon the substances to which it is applied? What precautions are to be observed in the desiccation of organic drugs?

81. Define Comminution. What are the chief kinds of comminution?

82. What is Contusion? State the form and arrangement of a mortar best adapted to contusion.

83. Describe the following varieties of Drug Mills: The Buhrstone, Roller, and Chaser Mills, the Disintegrator, and the principal forms of hand drug mills.

84. What is Trituration? Describe the forms of mortars and pestles best adapted to this purpose.

85. What are Levigation and Porphyrization?

86. What is Sifting? Describe some of the forms of revolving sifters. How is the fineness of powders designated in the Pharmacopœia?

87. Describe the process of Elutriation. Name an official substance which is obtained or purified by elutriation.

88. What is pulverization by intervention? How may camphor be powdered?

#### SOLUTION.

89. What is a solution? When is a solution saturated? What are the effects of pulverization and agitation on the rapidity of solution?

90. What is the effect of heat? Are there any instances in which the solubility of a substance decreases with increase of temperature?

91. What change in temperature generally occurs when solids dissolve rapidly in liquids without chemical action? If chemical action takes place what is the effect on the temperature?

92. What are the several methods of effecting solution? What is the process known as Circulatory Solution?

93. Compare the solvent properties of the following liquids: Water, alcohol, glycerin, ether, chloroform, bisulphide of carbon, volatile and fixed oils.

#### SEPARATION OF LIQUIDS FROM SOLIDS.

94. What is the process of washing solids known as *Lotion*? How may the process be made continuous?

95. What is the theory of washing by *Decantation*?

96. Explain the operation of the *Siphon*. What is the limit to the height through which a siphon will raise water?

97. What is the process of *straining*? How do the mediums employed for straining differ from those employed in *filtration*? Describe several forms of *strainers*.

98. Give a description of the method of folding plain and plaited filters. When should a plain filter be used in preference to a plaited one?

99. Describe a filter for upward filtration? What arrangement may be used for the filtration of volatile liquids?

100. How is hot filtration effected?



101. What is a Filter Pump? How is it used?

102. Describe several methods of clarifying liquids.

103. By what means are immiscible liquids separated from each other?

104. Define Precipitation. What is the most advantageous form of jar used for precipitation? What is the difference in the processes employed for the production of heavy and of light precipitates?

105. Describe the method of producing Granulated Salts. How is the Exsiccation of salts accomplished? What is the object of exsiccation?

106. What is the process of Dialysis? What kinds of substances dialyze? What kinds do not? Describe the common form of dialyzer.

107. What are some of the possible applications of dialysis? What are the substances known as Dialysates?

#### EXTRACTION.

108. Describe the processes of extraction known as Maceration and Digestion. What are their advantages and disadvantages?

109. What is Lixiviation?

110. Define Expression. Describe some of the common methods of producing expression.

111. What is the principle of the Hydrostatic or Hydraulic Press?

112. The power exerted by the press is how many times greater than the power applied?

113. Is there any creation of power?

114. What is the process of Percolation or Displacement? Give the pharmacopœial description of displacement.

115. What are the several forms of percolators in common use? How is a percolator fitted for percolation? What is the object of moistening the powder before packing?

116. What precautions are to be observed in packing? What facts determine the fineness of the powder to be employed?

117. When is previous maceration recommended? How is the flow of percolate controlled? How fast should the percolate flow when pharmacopœial quantities are operated upon?

118. Describe Dr. Squibb's Well Tube Percolator. Describe the Double Tube Percolator. The Dursse Percolator.

119. What is the Pressure Percolator?

120. Describe a convenient form of percolating shelf.

121. What is repercolation, and how is it accomplished? What are its advantages and disadvantages?

122. What is Continuous Percolation? For what is it employed?

#### CRYSTALLOGRAPHY.

123. What is Crystallography? What is a crystal?

124. Define the terms Face, Edge, Angle, and Axis, as applied in crystallography.

125. What is the meaning of Amorphous, Di-, Tri- and Polymorphous? What is Isomorphism?

126. What is meant by Cleavage? What determines its character?

127. How many systems of crystals are recognized? Name and define them, giving examples under each system.

128. What are the meanings of the terms Efflorescent, Deliquescent, and Hygroscopic? What is Water of Crystallization?

129. What are Tabular, Laminar, Acicular, and Prismatic Crystals?

## PART II.

### OFFICIAL PREPARATIONS.

REFERENCES:—United States Pharmacopœia, U. S. and National Dispensatories, and the treatises of Remington, Caspari, and Coblentz.

#### MEDICATED WATERS.

130. What is a Medicated Water? How many are official?

131. According to the character of the dissolved substances, into how many classes may the official waters be divided?

132. What waters consist of gaseous substances in solution? What are their percentage strengths?

133. What is the process usually employed for making a water containing a volatile oil? What are the objections to the use of magnesium carbonate? What waters are dilutions of stronger waters?

134. What waters involve a chemical reaction in their manufacture? Describe the several operations.

#### SYRUPS.

135. What is a Syrup? What is the difference between a medicated and an adjuvant or flavoring syrup?

136. How many syrups are official? What is the cold process for syrup?

137. Name the official syrups in which the medicating ingredients are largely or wholly inorganic?

138. What syrups are compound or contain more than one important flavoring or medicating ingredient?

139. What is the object of the precipitated calcium phosphate in the Syrup of Orange, Syrup of Lactucarium, Compound Syrup of Squill, Syrup of Tolu, and Syrup of Ginger?

140. What is the object of the sand and the washing in making Syrup of Tar?

141. What syrups are made by simple admixture of the medicating and flavoring ingredients with simple syrup?

142. What syrup contains ammonia water? What is its object?

143. What syrups contain acetic acid?

144. What syrups are made from fluid extracts?

145. What syrups are made from tinctures?

What syrup is made from a ripe fruit? What syrup is made from a vinegar?

#### MUCILAGES.

146. What are Mucilages? How many are official? What are the medical properties of the mucilages?

147. What mucilage contains glycerin, and is made with boiling water? What mucilages are made by cold maceration? What mucilage is made by digestion on a water bath? What can be said of the permanence of the mucilages?

#### OFFICIAL SOLUTIONS.

148. What are the official Solutions? How do they differ from the Waters? How many are official?

149. Are the solutions generally powerful or weak medicinal agents?

150. What official solutions contain Arsenic? What are their percentage strengths? How are they prepared? What are the popular synonyms for several of these preparations?

151. What official solutions contain Iron? What are their percentage strengths?

152. What is the principal use of Liq. Ferri Tersulphatis? Of Liq. Ferri Subsulphatis?

153. What official liquor has a specific gravity more than twice as great as water?

154. What official liquors contain caustic or corrosive substances?

155. In making Liq. Potassae or Liq. Sodae by the alternative process, how are the correct quantities of Potassa and Soda determined?

156. What is the object of the use of nitric acid and the subsequent addition of zinc carbonate in the preparation of Liq. Zinci Chloridi?

#### INFUSIONS AND DECOCTIONS.

157. What is an Infusion? How many infusions are official?

158. What is the general formula for an infusion the strength of which has not been directed by the physician nor by the Pharmacopœia?

159. What infusions are made by digestion with boiling water? What infusions are made by cold percolation?

160. What infusion contains an acid? What is the object?



161. What is a Decoction? How many are official? What is the general formula for a decoction the strength of which has not been specified?

162. What is the essential difference between a decoction and an infusion?

#### MIXTURES.

163. Within the meaning of the Pharmacopœia, what is a Mixture? How many mixtures are official?

164. Name the official mixtures and give the formulas for their preparation.

165. What mixtures of the U. S. P. 1880, are now classed as emulsions? What as solutions?

#### LINIMENTS.

166. What is a Liniment? How many liniments are official? How many liniments are made with fixed oil as a basis?

167. Classify the official liniments and name and describe the members of each class.

168. What liniments belong to the class of substances known as soaps?

#### HONEYS AND GLYCERITES.

169. Describe the Honeys. What honeys are official? How are they prepared?

170. What are the Glycerites, and how many are official?

171. What official glycerite involves a chemical reaction in its manufacture?

172. What glycerites are true solutions? What glycerite is a mere mixture?

173. What glycerite is of the consistence of a jelly? Give its formula.

174. What glycerite is essentially a fluid extract in which alcohol has been replaced by glycerin?

#### ELIXIRS AND SPIRITS.

175. What is an official Elixir? How many are official? Give the formula.

176. What is an official Spirit? How many are official? What spirits are solutions of essential or volatile oils in alcohol? Give their formulas.

177. Name and give the characters of the spirits made, by distillation, from fermented grain or fermented fruit juice.

178. Name the spirits which consist essentially of compound ethers or ethereal salts dissolved in alcohol. Describe the method of preparation.

179. What spirit is a solution of a stearopten in alcohol? Give its formula.

180. Name and give the formulas for the spirits which contain more than one medicating or flavoring ingredient.

#### EMULSIONS.

181. What is an emulsion? How does an emulsion differ from a mixture? Describe the process of emulsification. What are the English and Continental methods?

182. What precautions should be observed in making the nucleus? When is an emulsion said to be cracked?

183. Name some of the more important emulsifying agents.

184. What is the best method of emulsifying such substances as chloroform, salol, camphor, resins, waxes, balsam of Peru, essential oils?

185. Why is a fixed oil sometimes added to an emulsion of an essential oil?

186. What is the action of alkalies or alkaline salts upon emulsions? Of acids, glycerin or alcohol?

187. What emulsions are official? What were these called in the Pharmacopœia of 1880?

#### COLLODIONS.

188. What is an official Collodion? Name and describe the official collodions. How is Collodion of the Pharmacopœia made?

189. What chemical change takes place in cotton when it is treated with a mixture of nitric and sulphuric acids? What is the official title of the product?

190. How does the official Pyroxyton differ from the true gun cotton?

191. How should collodions be preserved? Why?

#### OLEATES.

192. What is the character of the official Oleates? Are the official compounds correctly named "oleates"?

193. Name the official oleates. How are they prepared? Are they permanent preparations?

#### OLEORESINS.

194. What is an Oleoresin? Name some natural oleoresins belonging to official materia medica.

195. Name the oleoresins for which a method of preparation is given by the Pharmacopœia. Describe the official process. What form of percolator should be used?

196. What official oleoresins separate precipitates on standing? In what cases should these precipitates be rejected?

### TINCTURES.

197. Define a typical Tincture. How many tinctures are official in the present Pharmacopœia?

198. What are the principal points of difference between the tinctures and the fluid extracts? When are the former to be preferred?

199. By how many different methods are the official tinctures prepared?

200. Name the tinctures which contain mainly inorganic substances.

201. How many and what tinctures are compound, i. e., contain more than one medicating ingredient?

202. Name the tinctures which are used mainly as adjuvants, i. e., either for their coloring or flavoring properties.

203. What tinctures are made by maceration? Why is maceration the best process in these cases?

204. What tinctures are made by boiling?

205. What tinctures are made by digestion?

206. What tinctures are made from other tinctures or fluid extracts?

207. What tinctures have aromatic spirit of ammonia as the menstrum?

208. What tinctures are made from animal drugs?

209. What tincture is made from the fresh fruit?

210. What tincture is made from an assayed solid extract?

211. What is the general formula for making tinctures of fresh herbs?

212. What is a general formula for making tinctures by maceration?

213. What is a general formula for making tinctures by percolation?

214. What menstruum is usually employed for making tinctures of strongly resinous drugs?

215. What menstruum is usually employed for drugs which contain simple bitter substances?

216. What tincture requires the use of sand in the process of manufacture?

217. What tincture requires sugar to be used in its manufacture?

218. Which will extract the larger portion of the soluble principles of a drug: a pint of alcohol and a pint of water percolated separately through the drug, or the two pints mixed before percolation?

219. What is the menstruum generally employed for drugs which contain considerable tannin?

220. What tincture is washed with ether in the process of manufacture? What does the ether remove?

221. What drug is first washed with benzin before the tincture is made from it? What purpose does the washing serve?

222. What tinctures are made to correspond to 5 per cent. of the drug? What reason can you assign for this low percentage strength? What tinctures are made to correspond to 7 per cent. of the drug?

223. What tinctures correspond to 10 per cent. of drug? What tinctures represent 15 per cent. of drug? 12 per cent.?

224. What is the usual strength of the opium preparations? Is there any exception to the general rule?

225. What tinctures have a strength of 20 per cent.? Of 30 per cent.

226. What tinctures have a strength of 35 per cent.? Of 40 per cent.? Of 50 per cent.?

(Note: By the "strength" of a tincture is meant the per cent. of the principal ingredient.)

227. What is the alkaloidal strength of Tincture of Nux Vomica? What is the strength of Tincture of Ferric Chloride?

228. In what respects do the tinctures resemble, and in what respects do they differ from the official spirits? The official solutions? The waters?

229. What tincture is made with a menstruum containing acetic acid?

230. What tinctures have an official method provided for their assay?



231. How many tinctures of rhubarb are official? What is the difference in their strength?

232. What tinctures are made with the use of precipitated phosphate of calcium? What purpose does the latter serve?

#### WINES.

233. What are the Wines? How many are official? What official wines are natural or unmedicated? What are the general characters of these? What is the required alcoholic strength, and how is this determined?

234. What are the advantages and disadvantages of the wines as compared with the tinctures and fluid extracts?

235. What wines are made by simple solution of the medicating substance?

236. What wines are made from a fluid extract? What wines are made by percolation? By maceration?

#### VINEGARS.

237. What are the characters of the official vinegars? How does the menstruum now used differ from that formerly used? What reason was there for the change?

238. Name the vinegars official in the present Pharmacopœia. What is the percentage strength of their active ingredients? Give the formulas for their preparation.

239. What are the advantages and disadvantages of the vinegars as a class?

#### FLUID EXTRACTS.

240. Define and describe a typical Fluid Extract of the U. S. P. How many fluid extracts are now official?

241. What relation does the quantity of crude drug bear to the quantity of finished product?

242. What are the principal points of advantage possessed by the fluid extracts over other fluid preparations of organic drugs?

243. What different processes are employed in the manufacture of the fluid extracts?

244. Give a general formula for the preparation of an official fluid extract.

245. What is the object of the maceration before percolating, and how long is it continued?

246. Why is a first portion reserved?

247. Why is the weak percolate evaporated to the consistence of a soft extract instead of merely to a quantity sufficient to make up the required product?

248. What style of percolator is best adapted to the preparation of fluid extracts? Why?

249. What fineness of powder is most frequently prescribed? In what cases is No. 80 powder ordered?

250. What is the amount of drug ordered by the Pharmacopœia for each operation? What is the amount of finished product? Are there any exceptions to the last question?

251. How many fluid extracts are made with alcohol or with diluted alcohol and glycerin?

252. What fluid extracts are made with menstruus containing an acid? What is the purpose of the acid?

253. What fluid extracts are made with a menstruum containing ammonia? What purpose does the ammonia serve?

254. What fluid extracts are made from mixtures of powdered drugs?

255. What fluid extracts are required to be assayed? Will the finished product necessarily measure 1,000 Cc.?

256. What is the quantity of first percolate usually reserved?

257. What fluid extracts are ordered to be made in a conical percolator? Why? When is a glass percolator ordered?

258. What kind of drugs are extracted with strong alcohol? What with diluted alcohol or with alcohol and water in varying proportions?

259. What is the general character of the drugs which are extracted with a menstruum containing glycerin?

260. When glycerin is ordered in the formula, with what menstruum is the percolation usually finished?

261. What fluid extracts are made by first preparing an aqueous infusion of the drug which is then evaporated and mixed with alcohol? What is the use of the alcohol in these cases?

262. In how many and in what fluid extracts is the temperature directed to be not greater than 50°

C.? What is the character of the drugs in such cases?

263. What fluid extracts are made by digesting the drug before percolation?

#### SOLID EXTRACTS.

264. Give a general definition for an official Solid Extract? How many extracts are official?

265. What is an alcoholic extract? How many extracts are made with a menstruum containing alcohol? Give a general formula for the preparation of an alcoholic extract.

266. In the case of what extracts does the method of extraction resemble the preparation of the fluid extracts?

267. How many and what extracts are made with aqueous menstrua?

268. What extracts are made with a menstruum containing an acid?

269. What extracts are made with the use of a menstruum containing water of ammonia? What is the use of the latter substance?

270. What extracts are made by the evaporation of a fluid extract?

271. What official extract is a commercial product?

272. What extract is made by macerating for four days and expressing before percolating?

273. What extract is made by mixing a powdered extract with soap, resin of scammony, cardamom, etc.?

274. What extracts are directed to be assayed? What is the final strength to which they are brought?

275. What inert ingredient is added for this purpose?

276. Give a brief outline of the process of assay in the preceding cases.

277. What extracts are directed to be evaporated to dryness?

278. What extracts are made by making a boiling decoction of the drug and evaporating it to the proper consistence?

279. What extracts are made by the evaporation of an expressed juice?

280. What are the extracts which are known to the trade as "inspissated juices"? How are they

prepared? What is generally thought of their merits?

281. To what consistence are extracts generally directed to be evaporated?

282. What is the general character of the extracts as regards permanence? What are the best methods of preservation?

283. Why is glycerin sometimes added to extracts? Are any of the official extracts directed to contain glycerin?

284. Do the official extracts, or any of them, bear a fixed relation to the quantity of the drug from which they are made?

285. What were the abstracts of the Pharmacopœia of 1880?

286. What are the principal faults of the present class of official extracts?

#### MASSES AND CONFECTIONS.

287. Name and describe the official confections?

288. What is the general character of the principal masses? How many are official?

289. What is the object of the addition of syrup to the solution of ferrous sulphate in making mass

of ferrous carbonate, and of washing the precipitated carbonate with water containing syrup?

290. What is the important medicinal constituent of this mass?

291. What two impurities are sometimes present in mass of mercury, and how is their presence determined? What is the formula for this mass?

#### RESINS.

292. What is an official Resin? What resins are official?

293. What official resins are commercial products obtained as a residue from the distillation of a volatile oil?

294. How are the remaining resins prepared?

295. How does a resin differ from an extract? What resin is made with the use of hydrochloric acid?

296. What is the purpose of the acid?

297. What is the common trade name of resin of podophyllum?

#### PAPERS.

298. What are the Chartæ of the Pharmacopœia? How are they prepared, and for what purposes are the official papers employed?



299. What is the object of the prior percolation of the mustard seed in the preparation of Charta Sinapis?

300. Is it material whether mustard paper be dipped in warm or hot water before applying? Why?

#### PILLS.

301. What is an excipient? Name some of the more useful liquid and solid excipients. What are the considerations which determine the choice of an excipient?

302. When may water be used as an excipient? What is the value of glycerin as an excipient?

303. What kind of an excipient would you use to make pills of such a substance as croton oil, tar, etc.

304. What is a good excipient to use in the case of powdered resinous drugs?

305. What excipient may be used for such substances as permanganate of potassium, oxide of silver, etc.?

306. How many formulas for pills are included in the U. S. P.? What are the manipulations for making a small number of pills? When a larger number are to be made how are they cut and rolled?

307. Describe the method of coating pills with sugar and with gelatin. With keratin.

308. How are compressed pills and tablets manufactured? What is a bolus?

#### POWDERS, TRITURATIONS, TABLET TRITURATES AND SUPPOSITORIES.

309. What is the general character of the official powders? What is the object of providing official formulas for these mixtures? How many are official?

310. What are the different methods of dispensing powders? Describe cachets and capsules and how they are used for dispensing powders?

311. What are triturations? What triturations are official? Give the general formula.

312. What are Tablet-triturations, and how are they prepared? What are Tablet-saturates?

313. What are Suppositories? Describe the manipulations for the preparation of suppositories: (a) By cold compression; (b) By moulding; (c) By rolling with the spatula.

314. What suppositories are official? What is the formula?

315. What are the sizes prescribed by the Pharmacopœia?

#### CERATES, OINTMENTS, PLASTERS, AND TROCHES.

316. What are the official Cerates? Why are they called cerates? How many are official? Into what two classes may they be divided according to the method of manufacture?

317. Name the cerates made by fusion, and their constituents.

318. Name the cerates made by incorporation, and their constituents.

319. What are Ointments? How do they differ from the cerates? Name the number of official ointments. What are the two general methods of manufacture?

320. Give some important rules to be observed in the preservation and dispensing of ointments.

321. Describe the Plasters. How many plasters are official? Into how many classes may they be divided?

322. Describe the several methods of spreading plasters.

323. What are Troches? How many are official? What is a popular name for Troche? Describe the general method of manufacture.

324. What official troche is liable to explode if triturated or struck while dry, either during or after manufacture?

325. What kind of medicines are adapted to administration in the form of troches?

326. What is the best mucilage to give adhesiveness to a Lozenge mass?

## PART III.

### GENERAL INORGANIC CHEMISTRY.

REFERENCES:—Simon's Manual of Chemistry, Bartley's Medical Chemistry, Atfield's Chemistry, Prescott & Johnson's Qualitative Analysis, U. S. Pharmacopœia, Beal's Notes on Equation Writing and Chemical Arithmetic, Lloyd's Chemistry of Medicines, Hoffman & Powers's Medicinal Chemicals.

#### EQUATION WRITING.

327. Describe the difference between chemical and physical change, and give one or more examples of each. Define Chemistry.

328. Describe the difference between elements, chemical compounds, and mechanical mixtures.

329. How many elements are known to chemists? Is it certain that the elements are not themselves compound?

330. Define Organic and Inorganic Chemistry.

331. What is the modern theory of the constitution of matter? Give some simple facts which tend to prove the existence of spaces between the particles of matter.

332. What is a Molecule? What reason can be assigned for believing that a molecule is composed of still smaller masses? What name is applied to these smaller parts? What does the name signify?

333. How many atoms are usually found in the molecules of the elements? Name some exceptions.

334. Define atomic weight. What is the unit, and what is it called?

335. What is meant by the valence of an element? What is the unit of valence? What terms are used to express the valences of atoms from one to seven? What are "Bonds?"

336. What are chemical symbols? Why are they used? How are they selected? How much of an element does a symbol represent?

337. What would be a perfect system of classification of the elements? What system at present most nearly satisfies these requirements? What is the nature of this system?

338. State the distinction between metals and non-metals. Is this distinction exact?

339. What is a Formula, and what does it represent? What quantity does it represent?

340. What are Coefficients and Subscripts?  
How are they used?

341. What are the three general classes of inorganic compounds?

342. What are oxides? What are hydroxides, and how are they formed? What is hydroxyl? What is an anhydride?

343. What are the substances known as Bases? What are some of their properties?

344. What are the Acids, and what are some of their common properties? What is an acid radical? What is basic hydrogen, and why so called?

345. What are Salts, and how are they formed? Define normal, acid, basic, and double salts.

346. Can a monobasic acid form an acid salt? Why?

347. How are several acids having a different amount of basic hydrogen distinguished by name?

348. What are oxacids? What are the meanings of the terminations -ous and -ic when applied to acids?

349. What are the meanings of the prefixes hypo- per- sesqui- and sub-?

350. What are the hydracids, and how are they named?

351. What are Binary Compounds? What must their formulas show concerning the equivalency of their atoms? Give a rule for writing the formula of a binary compound.

352. How may the subscripts of a formula be determined from the names and valences of the elements? When are subscripts omitted?

353. Give a rule for writing formulas containing compound radicals.

354. Write the formulas for Lithium chloride, Sodium fluoride, and Antimonous sulphide. Also for Silver nitrate, Ammonium oxalate, and Stannic phosphate.

355. What are "doubled formulas"? What elements form salts which require doubled formulas? Give a rule for writing the formulas of such compounds. Write the formulas of Mercurous chloride, Ferric nitrate.

356. What is a Chemical Equation? What is the use of equations? What signs are commonly used?

357. Define Synthesis, Analysis, and Metathesis.



358. What are Factors and Products? What is a by-product? When is an equation mathematically correct? When is it chemically correct?

359. Give a rule for the construction of equations, and illustrate by examples.

360. What is the usual action of a mineral acid on a metal? What is the usual by-product? Write an equation illustrating your statement.

361. What is the usual action of an acid on a metallic oxid or hydroxid? What are the by-products? Illustrate by equations.

362. When substances capable of uniting to form an insoluble compound are brought together in solution, what results? Illustrate by examples.

363. Define the terms Oxidation and Reduction.

364. What is Professor Johnson's rule for balancing equations involving oxidation and reduction? Within the meaning of this rule, what is understood by the word bond?

365. What are the bonds of an element in the free state? What is the sum of the bonds of a compound always equal to?

366. What is the character of the bonds of metals? How many bonds has oxygen, and what is their character?

367. What is the character of the bonds of an acid radical?

368. How many and what kind of bonds has hydrogen?

369. What is the usual action of nitric acid upon substances capable of being oxidized? What are the usual by-products? Complete and balance the following equation,  $\text{Cu} + \text{HNO}_3$ .

370. What is the usual action of nitric acid on sulphides? Complete and balance the following equations,  $\text{Cu S} + \text{H N O}_3$ , the acid being moderately dilute. Also  $\text{Cu S} + \text{H N O}_3$ , the acid being concentrated.

371. What is the usual action of concentrated, hot sulphuric acid upon a metal, and what are the by-products? Complete and balance the following equation,  $\text{Cu} + \text{H}_2 \text{SO}_4$ .

#### GENERAL INORGANIC CHEMISTRY.

372. What are the laws of Definite and Multiple Proportions?

373. What is the law of Gay Lussac, as to gaseous compounds?

374. What is the nascent state of elements? What properties characterize elements in this condition?

375. What is the Periodic Law of Mendeleeff? State some of the peculiarities of the table upon which the law is based.

376. How many elements are classed as non-metals? Name the most important ones. How many elements are classed as metals?

377. Is  $\text{NH}_4$  an element or a compound? Why is it generally considered along with the metals?

#### THE NON-METALS.

378. When and by whom was oxygen discovered? How does it occur in nature, and what percentage is it estimated to constitute of the earth?

379. State some of the modes of preparing oxygen. What is the common method of preparing oxygen for use in the laboratory?

380. What are the physical and chemical properties of oxygen? Describe Ozone, its preparation and properties.

381. When and by whom was Hydrogen discovered? How does it occur in nature, and what are some common methods of preparing it?

382. What are the chemical and physical properties of hydrogen?

383. Describe the preparation and properties of Hydrogen Dioxide. What is the strength of the official preparation? How is it assayed? How are impurities detected?

384. How does Nitrogen occur in nature, and how may it be obtained for experimental purposes? What are its chemical and physical properties?

385. What is the composition of the earth's atmosphere?

386. How many compounds of oxygen and nitrogen are known? Describe the preparation and properties of Nitrogen monoxide.

387. Describe the preparation and properties of Nitric acid.

388. Give three reactions by which nitric acid may be recognized. What is the strength of the official acid? What is the specific gravity? How are metallic impurities detected?

389. What is the mixture known as Aqua-regia or Nitrohydrochloric acid? What reaction takes place when the mixture is made? What constituent

of it dissolves gold and platinum? What care is to be observed in mixing and dispensing the acid?

390. What are the proper chemical names for spirit of hartshorn, laughing gas, aqua fortis, sand, brimstone, flowers of sulphur, milk of sulphur, oil of vitriol, muriatic acid?

391. What are the different forms in which Carbon occurs in nature? Give its symbol, valence, and atomic weight.

392. What forms of charcoal are official? How is animal charcoal purified? What are its properties?

393. Describe the preparation and properties of Carbon dioxide. What is the amount of carbon dioxide normally present in the atmosphere? What amount renders it unfit for respiration? How may carbonates be identified?

394. How is Carbon monoxide formed, and what are some of its properties? What is the substance known as Water gas? Describe Marsh gas.

395. How does Silicon occur in nature? Give its symbol, valence and atomic weight.

396. What is the commercial source of the Boron compounds? What compound of boron is official? What are the analytical tests for boron?

397. How does sulphur occur in nature? Give its symbol, valence and atomic weight. Describe its properties and the effect of heat upon it.

398. What is the difference between Sublimed and Precipitated sulphur?

399. What are the properties of Sulphur dioxide? What acid is formed when it dissolves in water?

400. Describe the preparation of the official Sulphurous acid. Of what strength is it? How are sulphites identified?

401. What is Sulphur trioxide? When and by whom was Sulphuric acid discovered? How was it originally prepared? What is the present process of manufacture? Describe its properties.

402. What is the strength of the official acid? What two preparations are official? Give the analytical reactions.

403. What are the antidotes to poisoning by sulphuric or any other strong mineral acid?

404. What is Thiosulphuric acid? What name is frequently improperly applied to the thiosulphates? What salt of this acid is official? How is it prepared, and what are its medicinal properties? What occurs when an acid is added to it?

405. State the mode of preparation and properties of Hydrogen sulphide. What is the chief use of this gas? What sulphides are official? How are sulphides detected?

406. What are the properties of Carbon disulphide? How is it prepared? For what is it used?

407. Give a brief description of Selenium and Tellurium, and their compounds. What elements do they most resemble?

408. How does Phosphorus occur in nature?

409. Give its symbol, atomic weight and valence.

410. How is phosphorus manufactured? Describe the properties of its Allotropic Modifications. What is allotropism? What is the chief use of phosphorus?

411. What official preparations are intended for internal administration? What is the medicinal dose? What is the treatment in cases of phosphorus poisoning?

412. How is phosphorus detected in cases of poisoning?

413. What are the principal oxides and acids of phosphorus? Which of these are official in the United States Pharmacopœia? How is Orthophos-

phoric acid prepared? What is the percentage strength of the present official acid? What is its specific gravity?

414. What are the tests for Phosphoric acid and the Phosphates?

415. How is the official Hypophosphorus acid prepared? What is its percentage strength? What are some characteristic reactions of its salts? Under what circumstances are they liable to explode? What are the medicinal uses of the hypophosphites?

416. Describe Hydrogen phosphide. Is it spontaneously inflammable when chemically pure?

417. What are the Halogens? How do they compare with each other as to their atomic weights, specific gravity, etc.?

418. Describe the natural occurrence of Chlorine gas. What is its symbol, valence, and atomic weight? Describe its properties.

419. What is the action of chlorine gas on organic coloring matters? What is the Chlorine Water of the Pharmacopœia? How is it prepared?

420. How is Hydrochloric acid prepared? What is the strength and specific gravity of the official



acid? Describe its properties, and some of its characteristic reactions. What are the official tests for impurities?

421. Describe Hypochlorous and Chloric acids, and their salts. By what reactions are they recognized?

422. If a chlorate be triturated with a readily oxidizable substance, such as sugar, sulphur, tannin, etc., what will probably occur? How should powders containing chlorates and oxidizable substances be mixed?

423. Describe the occurrence of Bromine. Give its properties, symbol, valence and atomic weight.

424. How is the official Hydrobromic acid prepared? What is its percentage strength? What are the characteristic reactions of the bromids? What are their medical properties?

425. Describe the natural occurrence of Iodine, and its properties. Give its symbol, valence, and atomic weight. What can you say of its hydrogen acid, and what are the principal tests for Iodine?

426. What are the medical properties of the Iodides? What is the official preparation of hydriodic acid? How is it prepared, and how should it be preserved?

427. Describe Fluorine and its hydrogen acid. In what kind of vessels would you preserve hydrofluoric acid?

428. What are the principal uses of this acid? What precaution should be observed in handling it?

#### THE METALS.

429. Give a general description of the Alkali Group of Metals.

430. State the occurrence of Potassium in nature, and in what form it is brought into commerce.

431. How is the metal obtained? What are its properties, and how should it be preserved?

432. What are the antidotes to the action of potassium hydrate and carbonate?

433. Describe briefly the nitrate, chlorate, and iodide of potassium, and state their principal uses. How many potassium compounds are official?

434. What is Potassa cum Calce? How is Liq. Potassæ prepared? What is its strength?

435. What official potassium salts contain organic radicals?

436. By what means are potassium compounds recognized? What official potassium compounds are

liable to produce explosions when triturated with easily oxidizable substances?

437. Give the symbol, valence, and atomic weight of Sodium. What is its chief natural compound?

438. Describe the preparation of sodium carbonate by the LeBlanc, and also by the Solvay process. Describe the bicarbonate, the sulphate, and the borate, and their properties.

439. What are the tests for sodium compounds?

440. What results from bringing a solution of sodium salicylate into contact with iron or iron compounds?

441. How many sodium compounds are official? How many of these contain organic radicals?

442. What is Sodium hyposulphite, and for what is it used? What official sodium compounds may react explosively under certain circumstances?

443. Describe the metal Lithium, its atomic weight, specific gravity, and valence. What is the source of the lithium compounds? What compounds are official? What are the medicinal uses of lithium salts?

444. How are the Ammonium compounds prepared? Describe the chloride and carbonate, and give the analytical reactions for ammonia.

445. What is the hypothetical ammonium?

446. How many ammonium salts are official? Name and describe the principal ones, their properties and uses.

447. What is the chemical constitution of the official ammonium carbonate? How may it be converted into normal carbonate? How are impurities in ammonium compounds detected?

448. Give the chemical formulas and the correct chemical names of the following substances: Potash, pearl ash, salt of tartar, nitre, saltpetre, common salt, sal soda, soda ash, baking soda, Glauber's salt, Chili saltpetre, borax. Also of sal ammoniac and aqua ammonia.

449. What are the principal natural compounds of Magnesium? What is its symbol, valence, and atomic weight?

450. How is magnesium related to the alkalies and alkaline earths? By what means is metallic magnesium obtained, and what are its properties?

451. Name the official compounds of magnesium. Describe magnesium carbonate and oxide. What is the difference in the mode of preparation of the heavy and light varieties?

452. Give the analytical reactions for magnesium. How can Epsom salt be distinguished from white vitriol?

453. Describe briefly the Alkaline Earth Metals. What are the principal forms in which Calcium occurs in nature? Give its symbol, valence, and atomic weight.

454. What is Lime, and what chemical change takes place in its manufacture? What chemical reaction takes place in the slaking of lime? Is lime most soluble in hot or cold water?

455. What is plaster of paris? What chemical change takes place in plaster of paris when mixed with water?

456. What are the analytical reactions for the calcium compounds? How many compounds of calcium are official? What is the official name for Calcium carbonate?

457. What is the most striking property of calcium chloride? For what is it mainly used?

458. What are the chemical formulæ and the correct chemical names for calcined magnesia, epsom salt, slaked lime, lime water, chalk, limestone, marble, bleaching powder, chloride of lime, and heavy spar?

459. Describe briefly Strontium and its reactions. Describe the official compounds of strontium and their properties.

460. Describe briefly Barium, its compounds and reactions. What are the official uses of barium compounds?

461. Describe the principal forms in which Aluminum occurs naturally. How is the metal obtained from its ore? What are the Alums? Describe aluminum hydroxide and its properties. What compounds are official? How is the official Alum distinguished from the Ammonia alum?

462. What is Clay? What change takes place in converting clay into ware?

463. What is now used as Ultramarine? What was formerly used as ultramarine? What are the analytical reactions for aluminum?

464. Describe briefly Cerium, its preparation, properties and reactions. What compound is official and what are its medicinal uses? What is the chemical formula?

465. Give the symbol, valence and atomic weight of Iron. How is it manufactured?

466. What is the difference between cast and wrought iron and steel? What is Reduced Iron? What are the chief ores of iron?

467. What two series of salts does iron form? Describe ferric hydrate, ferric chloride, and ferrous sulphate.

468. What is the office of the nitric acid which is used in making solution of ferric chloride?

469. How are Solutions of Ferric Chloride, Acetate, Citrate, Nitrate, Subsulphate, and Persulphate prepared? What is the percentage strength of each?

470. What is the object in using boiling distilled water and a wash water containing sugar in preparing Saccharated Ferrous Carbonate?

471. What are the reactions of soluble sulphides, alkaline hydroxids, cyanides, ferricyanides, ferrocyanides, and sulphocyanides with both ferrous and ferric salts? What are the properties of the iron compounds?

472. Give the symbol, atomic weight and valence of Manganese. Describe the metal.

473. What is the chief natural compound of manganese? What is the character of the official article? How is it assayed?

474. Describe Potassium permanganate, its preparation and its properties. What other compounds of manganese are official, and what are they used for?

475. What are the analytical reactions for manganese? How does manganese color the borax bead?

476. What is the natural occurrence of Chromium. Give its symbol, atomic weight, and valence. What compounds are official? Describe them. Is the official title *Acidum chromicum* correct? Why?

477. What precaution should be observed in combining chromic acid with oxidizable, i. e., with combustible, substances?

478. How is chromium detected when combined as a base? How when combined as an acid? How do chromium compounds color the borax bead?

479. Describe briefly Cobalt and Nickel, and the means of identification. How do these elements color the borax bead? Are there any official compounds of these?

480. What is the natural occurrence of Zinc? How is the metal obtained, and what are its properties? What is the symbol, valence, and atomic weight?



481. Name the official compounds of zinc. What are the properties of zinc chloride? Describe zinc sulphate and its properties. What are the antidotes for poisoning by zinc compounds?

482. What are the characters of the official zinc oxide?

483. What are the analytical reactions for zinc? What is Brass?

484. What are the chemical formulæ and the correct chemical names of emery, alum, iron rust, lode stone, green vitriol, copperas, Prussian blue, Prussiate of potash, prussic acid, and white vitriol?

485. Give a brief description of Cadmium, its properties and analytical reactions. Are any of the compounds of cadmium official?

486. Give the symbol, valence, and atomic weight of Lead. What is the substance known as "white lead"? What compounds of lead are official? What is the cosmetic known as "Flake White"?

487. What is the difference between red lead and litharge?

488. What are the antidotes to poisoning by lead compounds? What are the chief analytical reactions for lead salts?

489. Are lead salts in solution compatible with chlorides, sulphates, carbonates, sulphites, or sulphides?

490. What are the prominent symptoms of poisoning by lead compounds?

491. Describe Copper and its occurrence in nature. Give its symbol, valence, and atomic weight.

492. What compound of copper is official? What is "blue stone"? What are the antidotes to poisoning by copper?

493. What are the analytical reactions for copper salts?

494. Give the symbol, atomic weight, and valence of Bismuth. Describe the metal, and describe how it occurs in nature. What peculiar reaction takes place when its salts are dissolved in a large amount of water?

495. What is Bismuthyl? Describe the subnitrate, subcarbonate, and subiodide of Bismuth.

496. Describe the citrate, and the citrate of Bismuth and Ammonium. What is the purpose of the Ammonium in the latter compound?

497. What are the medicinal uses of the bismuth salts? What are the analytical reactions for bismuth?

498. State the symbol, valence, and atomic weight and mode of occurrence of Silver. Name and describe the official compounds of silver.

499. What are the most prominent reactions of silver? What is the official use of silver cyanide? What is lunar caustic? What change occurs in silver salts exposed to the light?

500. Should silver oxide be triturated or combined with oxidizable substances or with ammonia? How ought silver salts to be preserved?

501. Can silver be combined in solutions with chlorides, carbonates, bromides, iodides or sulphides? Why?

502. State the symbol, valence, atomic weight, and the melting and boiling points of Mercury. What is the chief ore, and where is it principally obtained? What two series of salts does it form?

503. Is the valence of mercury in mercurous salts one or two? How is this explained? How many compounds of mercury are official?

504. Describe the Red Oxide, Mercurous and Mercuric chlorides, the nitrates, the Sulphide, and Ammoniated compounds.

505. How can Calomel be distinguished from corrosive sublimate?

506. What harmful substances are likely to be found in old specimens of "mercury with chalk" and in mass of mercury?

507. What would be the probable result of a drug clerk's putting up mercuric chloride when the mercurous chloride was ordered? How do you account for the greater poisonous qualities of the mercuric over the mercurous salt?

508. How is solution of mercuric nitrate prepared? What are its properties? What is its specific gravity?

509. Describe the following preparations of mercury: red oxide, subsulphate, red iodide, yellow iodide, and mercuric ammonium chloride. What would be the medicinal dose of each?

510. Give the more prominent analytical reactions of mercury? What occurs when a bright piece of copper is brought into contact with a mercury compound?

511. Give the symbol, valence and atomic weight of Arsenic. What are its principal ores? How may the element be obtained? What is the sub-

stance sold in the shops as "Arsenic?" What are the medical uses and doses of the arsenic compound?

512. Describe the official arsenical compounds. What are the analytical reactions for the detection of arsenic? What is Reinsch's test?

513. What are the U. S. P. tests for arsenic as an impurity in official chemicals?

514. What is the antidotal treatment for arsenical poisoning? What is the percentage strength of the official arsenical solutions? How is the antidote prepared? What is the principle of its action?

515. What is the symbol, valence, and atomic weight of Antimony? What is the chief ore, and how is the metal obtained from it? Describe the official antimony compounds and their properties. What is the percentage of tartar emetic in wine of antimony?

516. What are the tests for antimony? How are its compounds distinguished from those of arsenic? What are the antidotes?

517. Give the symbol, valence, and atomic weight, and describe the principal compounds of, and the tests for, Tin.

518. Give a brief description of Gold, Platinum, and Molybdenum, their official compounds and reactions.

519. What are the chemical formulas and the proper chemical names of the following substances: litharge, sugar of lead, blue vitriol, blue stone, pearl white, lunar caustic, red precipitate, calomel, corrosive sublimate, white arsenic, kermes mineral, and tartar emetic. Is the name Arsenious acid as used by the U. S. P. properly applied?

## PART IV.

### ORGANIC AND PHYSIOLOGICAL CHEMISTRY.

REFERENCES:— Same as cited for Part III.

#### ORGANIC CHEMISTRY.

520. Give a definition of Organic Chemistry as now understood.

521. What can you say of the character and number of elements entering into organic compounds? How may we account for the vast number of compounds from so few elements?

522. What can you say of the general properties of organic compounds, and the relation of properties to the number and character of the atoms entering into the molecule?

523. Describe briefly Elementary or Ultimate Organic Analysis. How does it differ from Proximate Organic Analysis?

524. State the means by which the elements, carbon, hydrogen, oxygen, nitrogen, sulphur, and phosphorus are determined in organic compounds.

525. How is the atomic constitution of an organic molecule determined from the percentage results of its analysis?

526. Define and describe the differences between empirical, rational, structural, and graphic formulas.

527. What is the radical of an organic acid? Give examples.

528. What are chains? What are homologous series? Why does a homologous series always increase by  $\text{CH}_2$ ?

529. What are types? Name five typical organic compounds. Five inorganic types.

530. What is substitution? Illustrate. What are derivatives?

531. Define Isomerism, Polymerism and Metamerism.

532. Describe the process of combustion and of decay; of fermentation and of putrefaction. What are the distinctions?

533. What is the difference between antiseptics, disinfectants, and deodorants?



534. Give a general classification of organic compounds.

535. Describe the class of Hydrocarbons, their natural occurrence, artificial preparation, and properties.

536. Name and give the formulas for the hydrocarbons of the Methane series.

537. What is the general formula for the series, and what does it mean?

538. Describe Methane and its properties. Describe Petroleum. What is understood by the flashing point? What are the constituents of Benzin?

539. Give a brief description of the preparation of illuminating gas. What are its chief constituents?

540. Name the hydrocarbons of the Olefine series, and give their formulas. What is the general formula of the series?

541. What are the general characters of the substances known as volatile or essential oils?

542. What general distinction may be made between the fatty and aromatic carbon compounds?

543. Describe the class of carbon compounds known as Alcohols, and give their general formula. How are they formed, and what are their properties?

544. Describe briefly Methyl and Ethyl alcohols and name the tests for their identification.

545. What is Amyl alcohol? How is it made? What is its formula? What acid results from its oxidation?

546. Name and describe the common liquors containing ethyl alcohol.

547. Describe Glycerin and its reactions. Describe Nitroglycerin, and give its formula. What is Dynamite?

548. What are the substances termed Phenols?

549. Describe the class of carbon compounds known as Aldehydes. What is the aldehyde group or radical? Give a brief description of Acetic aldehyde and its properties.

550. Describe the method of preparation and the properties and tests of Paraldehyde, Chloral, and Chloral hydrate. What are their chemical formulas and how are the substances identified? What are the medical uses and dose of chloral hydrate?

551. Describe the preparation of Chloroform, Bromoform and Iodoform. What are their formulas and physical properties? What are their physiological properties?

552. What is the constitution of Sulphonal, and how is it prepared?

553. What is the group which, being attached or united to a hydrocarbon residue forms an organic acid? What are the general characters of the organic acids?

554. Describe Formic and Acetic acids and their tests.

555. Describe Acetone, and give the general formula for the series of compounds known as Ketones.

556. Describe briefly Butyric, Valerianic, and Oleic acids, giving their formulas.

557. Describe briefly Oxalic, Tartaric, and Citric acids, and the tests by means of which they may be discriminated.

558. Describe the class of compounds known as Ethers. What is Ethyl ether, and how is it formed?

559. What are the compound ethers or ethereal salts? Describe Ethyl acetate, Ethyl nitrite, and Amyl nitrite.

560. What are the chemical characters of fats and oils? What is a soap? What is an important by-product in the manufacture of soap?

561. Describe Lanolin. What is the most marked property of this substance?

562. Describe the class of carbon compounds known as Carbohydrates. Is the name appropriate? Why? What are the three groups of carbohydrates and their general formulas?

563. How is glucose artificially prepared? How is it detected?

564. What is the formula for Cane Sugar? How does it differ from glucose? Which is sweeter? Describe Milk Sugar.

565. What is Starch? How does starch react with Iodine? What is Dextrin? How is it prepared from starch?

566. What is Cellulose? What are the Gums? How is Pyroxylin prepared, and in what is it soluble? Describe the substance known as Glycogen.

567. Describe the Glucosides and name some of the more important. What is produced when a glucoside is boiled with a dilute acid?

568. Describe Myronic acid and its formation in mustard seed.

569. What are the forms in which nitrogen may be present in organic compounds? What are the

Amines and Amides, and how do they differ from each other?

570. Give a brief description of Cyanogen and Paracyanogen. How is Hydrocyanic acid detected? What are the Metallo-cyanides?

571. What are the physiological properties of hydrocyanic acid and the soluble cyanides?

572. What is the Benzene series of carbon compounds? What is the Benzene Ring? Name the members of the benzene series and give their chemical formulas. Describe the preparation of and the properties of Nitro-Benzene.

573. What are the Phenols? Describe Carbo-lic acid and the tests for it. How is Picric acid prepared? What is its formula? Describe its properties.

574. What is Resorcin? What are its properties? Describe Cymene. Describe the hydrocarbons known as Terpenes.

575. What are the Resins? What are the distinctions between an Oleoresin, a Gum Resin, and a Balsam?

576. Describe India Rubber and Guttapercha. What is vulcanization?

577. What are the Stearoptens or Camphors? Describe, Laurinol, Menthol, and Thymol.

578. Describe Benzoic acid and Oil of Bitter Almond, and their relations. What is the relation of benzoic acid to benzene? What is its formula? What is its natural origin? How may it be artificially prepared?

579. How is Salicylic acid derived theoretically from benzene? What is its formula? How does the empirical formula differ from that of benzoic acid?

580. In what natural compound does salicylic acid exist in combination with the radical methyl? How can salicylic acid be artificially prepared?

581. What is the chemical relationship of Pyrogallie acid? How is it affected by light?

582. What is the substance called Tannic acid? What is its natural origin, and how is it prepared?

583. How does tannin, or liquids containing it, react with solutions containing iron, gelatin, alkaloïds, albumin, and tartar emetic?

584. Describe Napthalin and Napthol. How are they related?

585. What is Gallic acid and how is it prepared? How may it be distinguished from tannin?

586. What is the formula for Aniline and how is it prepared? What can you say of its compounds?

587. What is the chemical constitution of Acetanilid? What is the chemical name? What are the compounds known as "anilids"? What is the official test of identity?

588. What is Antipyrin? How is it prepared? Name some of its chemical reactions. What are its medical uses? How may it be distinguished from acetanilid?

589. Describe Saccharin. How is it a derivative of benzoic acid? How many times is saccharin sweeter than cane sugar?

590. What are the alkaloids chemically? How are they related to ammonia?

591. What is the difference in composition of the solid, non-volatile, and the liquid, volatile alkaloids?

592. What inappropriate names are generally applied to the compounds of the alkaloids with the hydrogen acids?

593. What difference in solubility exists between the alkaloids and their salts?

594. Name the most important general precipitants of the alkaloids.

595. What is the usual mode of obtaining alkaloids from plants?

596. Give a description of the manner in which alkaloids may be separated from the tissues of animals which have been poisoned.

597. What are the principal alkaloids found in Opium? What is the chemical formula for Morphine? Give the analytical reaction for morphine. What change does it undergo when heated under pressure with hydrochloric acid?

598. What is the common dose of the morphine salts? What is the chemical formula for Codein? Give some of its analytical reactions. What are its medical uses and dose?

599. How many alkaloids are found in Cinchona? Name the principal ones. Give the formulas for Quinine and its sulphates. What are some analytical reactions for quinine?

600. Describe the alkaloids Cinchonine and Cinchonidine.

601. What is the natural origin of Strychnine? How is it extracted? What is its formula? What are its characteristic reactions?



602. Describe Brucine. How is it distinguished from strychnine?

603. Describe Atropine and its reactions. What action has it on the pupil of the eye? How would you distinguish atropine from strychnine?

604. What is the formula of Cocaine? From what plant is it derived, and how does it exist in the plant? Give its chemical constitution, properties and reactions.

605. Describe Aconitine. What are its physiological properties? Is there any known characteristic reaction for it?

606. Give the formula for Veratrine and its characteristic reactions.

607. Describe the alkaloid Hydrastine. How does it react with sulphuric acid? With nitric acid? What peculiar appearance is presented by solutions containing it or its salts?

#### PHYSIOLOGICAL CHEMISTRY.

608. What are the chief differences in the foods of animals and plants?

609. Name and describe the several processes of nutrition.

610. Describe the composition of the blood and the examination of blood stains.

611. In what fluid of the animal body is Potassium sulphocyanide found?

612. What is Gmelin's test for biliary pigments? Pettenkofer's test for the bile acids?

613. What is the official substance known as Pepsin? What is the U. S. P. requirement for strength?

614. What is the average composition of cow's milk?

615. What chemical change takes place when milk sours? What causes the coagulation of the casein? What is cheese?

616. Give a brief outline of the complete analysis of milk.

617. What is the value of specific gravity as a test for milk? What is the effect of skimming on specific gravity? Of the addition of water?

618. Give a general description of the bases called Ptomaines, their formation and properties.

619. What is the supposed connection between Toxins and infectious diseases? Name some of the more common toxins.

620. Describe the Leucomaines. What is the difference in the mode of origin of the leucomaines and the ptomaines?

621. Give a general description of the Proteids and some of their properties. Describe some of the principal tests for proteids.

622. What are Peptones? Describe Hæmoglobin.

623. What are the Enzymes or unorganized ferments? Name some of the more important.

#### THE URINE AND ITS ANALYSIS.

624. What is the average composition of normal urine? How may the composition vary from day to day in health? What is the per cent. of total solids? Of water?

625. Describe the most important solid constituent, giving its chemical composition and the decompositions which it undergoes. What are the reactions by which it is identified and the method of estimating it quantitatively?

626. What is the composition of Uric Acid? In what quantities is it found in normal urine? How may it be identified and estimated?

627. Describe the most prominent characters of Hippuric Acid, its analytical reactions, and identification.

628. What are the several points to be considered in the examination of urine?

629. What is the color of normal urine and how may it vary? What is the principal coloring matter normally present and how is it detected?

630. What are some of the coloring matters which may be present in abnormal urine and how are they detected?

631. What is the reaction of normal urine? What does an alkaline reaction indicate? What substances administered as medicine may cause an alkaline reaction?

632. What is the specific gravity of normal urine? Within what limits may it vary in a state of health? How may it vary in diseased states? What do very high or very low specific gravities indicate, if persistent?

633. How may the total solids of urine be estimated? How may they be calculated from specific gravity?

634. How may the chlorine, phosphoric acid, sulphuric acid, calcium, and magnesium be determined quantitatively?

635. In what diseased conditions is albumin found in the urine? Albumin when present is commonly found in what form?

636. If the urine is cloudy, what is the first step before testing for albumin? How may a cloud of urates be distinguished from albumin? A cloud of earthy phosphates?

637. Describe the following tests for albumin and give the conditions necessary for their successful application: Nitric acid test, Picric acid test, Potassium Ferrocyanide test, Metaphosphoric acid test, and the coagulation by heat test. In applying the last test, what is the best acidifying agent? What is the result of too great acidity?

638. How is albumin best estimated quantitatively? How may the presence of peptone be shown?

639. What characters does blood impart to the urine? How can the presence of blood be verified?

640. Under what circumstances is sugar found in urine? What is the usual specific gravity when sugar is present? What are the following tests for sugar, and what conditions must be observed to ensure correct results: Trommer's test, Fehling's test, Botger's test, Moore's or Heller's test, Molisch's test, and the Phenyl-hydrazine test?

641. If albumin is present, what must be the procedure before applying the tests for sugar?

642. How is sugar estimated quantitatively? How must Fehling's solution be preserved to insure its efficiency?

643. How is the presence of bile in the urine determined? Describe Gmelin's, Ultzman's and Pettenkofer's tests for bile pigments and acids.

644. What is the so called "diazo-reaction"? How is the reaction obtained, and what does it indicate? What circumstances may render the results untrustworthy?

645. What are the deposits most frequently found in urine? How may they be identified? Is the presence of albumin in the urine not accompanied by tube casts sufficient evidence upon which to assert the existence of Bright's disease?

646. What are urinary calculi? What are the kinds commonly found? How are they identified as to composition?

## PART V.

### CHEMICAL ANALYSIS—QUALITATIVE AND QUANTITATIVE.

REFERENCES:—Simon's Manual of Chemistry, Oldberg and Long's Pharmaceutical Laboratory Manual, Schimpf's Volumetric Analysis, Curtman's Qualitative and Volumetric Chemical Analysis, Prescott and Johnson's Qualitative Analysis, Remington's Practice of Pharmacy, U. S. Pharmacopœia, etc.

#### QUALITATIVE ANALYSIS.

647. What is the distinction between Qualitative and Quantitative Analysis?

648. What is meant by acid or alkaline reaction? How are acidity and alkalinity shown?

649. What substances impart color to the flame, and what are the colors?

650. What substances color the borax bead, and what colors do they impart?

651. What metals are precipitated by the addition of hydrochloric acid or a chloride?

652. What metals are precipitated by hydrogen sulphide in acid solution?

653. What metals are precipitated by ammonium hydroxid? Which of these re-dissolve by an excess? What metal forms a deep blue solution with ammonia?

654. What metallic sulphides are soluble in ammonium sulphide? What metals are separated by means of this solubility of their sulphides?

655. What sulphides are yellow? What sulphides are flesh color, brown, and black?

656. What chloride insoluble in water and acid is soluble in ammonia hydrate?

657. What insoluble chloride turns black on the addition of ammonia hydrate?

658. What metals form insoluble yellow chromates? Red chromates?

659. What yellow sulphide is not soluble in ammonium sulphide?

660. What sulphide of the second group is not soluble in nitric acid?

661. What metals precipitate as yellow iodides? As red iodides? As brown iodides?

662. What is the reaction of a sulphocyanide on ferrous and on ferric salts?



663. What metals precipitate as insoluble sulphates?

664. What is the reaction of stannous chloride on a compound of mercury?

665. How does metallic copper react with a mercury compound?

666. How does metallic iron react with a copper compound?

667. When cadmium and copper are mixed how is the former element detected?

668. How is lithium detected in the presence of strontium?

669. How is nickel detected in the presence of cobalt?

670. How are calcium and strontium detected in the presence of each other?

671. What are the usual pharmacopœial tests for the detection of arsenic, copper and lead in official chemicals? Should the above tests be applied in alkaline or acid mixtures?

672. What are the usual pharmacopœial tests for the detection of iron, zinc, and aluminum when

present as impurities in official chemicals? Also, for calcium, magnesium, sodium and potassium?

673. What is the official method for the detection of iodine in potassium bromide? Of sulphocyanate in sodium carbonate?

674. What are the usual pharmacopœial tests for carbonates, sulphates, chlorides, iodides, bromides, phosphates, nitrates, and nitrites as impurities in official chemicals?

675. What is the official test for empyreumatic substances in water of ammonia? In ammonium chloride?

676. What is the official test for the presence of barium when present in lime or calcium chloride?

677. What is the official method for the detection of ammonia in aluminum compounds?

678. How is antimony sulphide detected when present as an impurity in manganese dioxide? Other metallic sulphides?

679. What is the official test for cadmium in zinc compounds?

680. What is the official test for the presence of ferrous salts as impurities in ferric compounds?

681. What is the official test for foreign salts in silver nitrate?

682. What is the official method for detecting cotton seed fat as an adulterant of lard?

#### VOLUMETRIC METHODS.

683. What is the difference between Gravimetric and Volumetric Quantitative Analysis? What are the advantages and disadvantages of the volumetric methods?

684. What is a Standard Solution? What is the Meaning of  $\frac{N}{1}$ ,  $\frac{N}{10}$ ,  $\frac{N}{100}$ ,  $\frac{N}{2}$ ,  $\frac{2}{N}$ .

685. What is an empirical standard solution?

686. What will be the number of grams of the following substances, respectively, to make one liter of decinormal solution: Sodium thiosulphate, potassium hydroxide, sulphuric acid, oxalic acid, potassium dichromate, and potassium permanganate?

687. What are the different methods of volumetric determination?

688. What is Titration, and what are the principal processes?

689. Describe the use of Indicators, and name some of the more important ones.

690. Describe the use of Litmus, Brazil Wood and Phenolphthalein as indicators.

691. What is the meaning of the terms Alkalimetry, Acidimetry, Oxidimetry?

692. What is the volumetric method for the assay of Diluted Hydrocyanic Acid? What is the purpose of the potassium chromate which is used in the process? Can the assay be made in the presence of free acid or alkali? Why?

693. What is the usual official method of determining the strength of official acids and alkalies? What is the indicator usually employed? How does phenolphthalein react with acids and alkalies? When can it not be employed?

694. What is the official method for the assay of Amyl Nitrite and Spirit of Nitrous Ether? What is the form of nitrometer recommended by the Pharmacopœia?

695. How is Chlorine Water directed to be assayed by the Pharmacopœia?

696. What is the official method of assaying Hydrogen Dioxide? Express the reaction which occurs by an equation. Is  $\text{H}_2\text{O}_2$  ordinarily an oxidizing or reducing agent? In which capacity does it act in the foregoing reactions?

697. What is the official method of assaying *Fer-  
rum Reductum*? What per cent. of metallic iron  
should it show? What reactions take place in the  
assay?

698. What chemical change takes place in the  
assay of Iodine? What per cent. of Iodine should  
the assay show?

699. What are the official methods for the assay  
of ferrous and ferric compounds, respectively?

700. How is Manganese Dioxide assayed? What  
per cent. of pure  $MnO_2$  should it contain?

#### GRAVIMETRIC METHODS.

701. What is a common process of assay directed  
by the Pharmacopœia for salts containing a metal  
combined with an organic radical?

702. What crude drugs, tinctures, extracts, fluid  
extracts, and spirits have a process of assay pro-  
vided by the Pharmacopœia?

703. What is the official assay process for  
Opium? What per cent. of morphine should be pres-  
ent? What is the purpose of the ammonia water  
used in the process? Why should the alkaloid be  
washed with alcohol saturated with morphine?

704. What quantity of egg albumin should pepsin digest to fulfill the official requirements? How is the process performed?

705. What is the pharmacopœial method of determining the alcoholic strength of red and white wine?

706. What is the official process for the assay of extract of *Nux Vomica*? What per cent. of total alkaloids should be found? What official tincture is made from this extract?

707. What is the official process for the assay of *Cinchona*? What per cent. of total alkaloids should be present? What per cent. of quinine?

708. What is the official method for the assay of Pancreatin?

## PART VI.

### CHEMICAL AND PHARMACEUTICAL ARITHMETIC.

REFERENCES:—Oldberg's Pharmaceutical Problem's and Exercises; Beal's Notes on Equation Writing and Chemical Arithmetic.

#### CHEMICAL ARITHMETIC.

709. Name some of the facts which may be learned from the observation of Chemical Formulæ and Equations.

710. What is the Molecular Weight of a compound and how is it calculated?

711. When the percentage composition of a compound is required to be calculated from its chemical formula, what is the principle of the solution? Give the rule?

712. Calculate the per cents. of the several elements in the formula  $\text{Fe SO}_4$ .

713. When it is required to calculate the amount of constituent which may be obtained from a fixed amount of compound, what is the principle involved in the solution? Give the rule.

714. Calculate the amounts of the several constituents found in fifty grams  $\text{Ba SO}_4$ .

715. What is the principle involved in solving problems in which it is required to calculate the amount of compound necessary to furnish a fixed amount of constituent? Give the rule.

716. Calculate the amount of  $\text{H}_2 \text{ SO}_4$  required to furnish fifty grams of hydrogen.

717. What are the three classes of problems based on equations? What is the general rule of proportion by means of which all such problems may be solved?

718. Given 150 Kilos of Zinc, how much hydrogen will be evolved by its solution in sulphuric acid? Explain the method of solution.

719. Given 15 Kilos of hydrogen, how much zinc is required to release that amount from sulphuric acid? Explain the principle of solution.

720. Given 75 Kilos of sulphuric acid,  $\text{H}_2 \text{ SO}_4$ , how much zinc will be required to exactly combine with it?

721. When gases are under consideration what is understood by normal pressure and temperature?



722. A number of grams, equal to its molecular weight, of a normal gas measures how many liters? How can you determine the weight of one or more liters of a normal gas from its molecular weight?

723. What is the weight of ten liters of hydrobromic acid,  $\text{HBr}$ ?

724. What is the weight of one liter of normal hydrogen? What is this weight sometimes called?

725. How can you calculate the volume of a gas in liters from its normal weight in grams?

726. What is the volume of thirty-two grams of oxygen?

727. What is Boyle's Law as to the variation in volume caused by variation in pressure?

728. Two hundred liters of carbon dioxide at a pressure of 800 mm will measure how many liters at 600 mm? At what pressure would it measure 300 liters?

729. What is Absolute Temperature? How is it found from Centigrade temperature?

730. What is the coefficient of gaseous expansion due to change in temperature?

731. What is Charles's Law? Is the law exact?

732. A volume of gas measuring 120 cubic centimeters at  $15^{\circ}$  Centigrade will measure how much at  $30^{\circ}$  Centigrade?

733. A volume of gas which measures 273 Cc. at zero Centigrade would have what volume at  $-273^{\circ}$  C.?

734. When both temperature and pressure vary, how is the resulting volume calculated?

735. The volume of a gas measures 100 cubic centimeters at  $0^{\circ}$  Centigrade and 750 mm pressure, what will its volume be at  $273^{\circ}$  Centigrade and 1500 mm pressure?

736. What is Specific Gravity, and how is it related to weight and volume? What is the standard in the case of liquids and solids?

737. The practical determination of specific gravity includes what two distinct processes?

738. By what means may we determine the volume of a body so irregular in form as to be incapable of direct measurement? By whom is this principle said to have been discovered?

739. What is the common rule for finding specific gravity?

740. What is the specific gravity of a liquid which weighs twelve grams and measures eight cubic centimeters?

741. Given the volume and specific gravity of a substance, how may you determine its weight?

742. What is the weight of three liters of glycerin, its specific gravity being 1.25?

743. Given the weight and specific gravity of a substance, how may its volume be calculated?

744. What is the volume of 100 grams of glycerin, its specific gravity being 1.25?

#### ALLIGATION.

745. If there be mixed a number of substances, each containing a different per cent. of a common constituent, how do you determine the percentage of that constituent after the admixture?

746. What will be the percentage strength of a mixture of three samples of a drug, ten grams of which contain ten per cent. of the common constituent, fifteen grams of which contain twelve per cent. and six grams of which contain eight per cent.?

747. A mixture of a fixed percentage strength or specific gravity is required to be made from two

ingredients, one of which has a lower and the other a higher percentage strength or specific gravity than the required mixture, how are the proportions calculated?

748. Calculate the proportions of opium of eight per cent. and twelve per cent. morphine strength, required to furnish a mixture of ten per cent.

749. When three or more ingredients are given, how is the problem solved?

750. Given opiums of six, eight, and twelve per cent. to make a drug of ten per cent., what are the proportions?

751. When the quantity of one ingredient is fixed how are the proportions determined?

752. When the quantity of product is fixed how are the proportions determined?

## PART VII.

### BOTANY AND PHARMACOGNOSY.

REFERENCES:—Bastin's Botanies; Gray's and Wood's Botanies; Sayre's Materia Medica; Maische's Materia Medica; U. S. Pharmacopœa; the Dispensatories, Culbreth's Pharmaceutical Botany, Essentials of Vegetable Pharmacognosy, by Rusby and Jelliffe. Also a series of papers on Pharmacognosy by O. A. Wall in *Meyer Brothers' Druggist* for 1895.

#### ORGANOGRAPHY.

753. Define Botany, Pharmacognosy, and Materia Medica.

754. What are the parts of a completely developed plant? What are the organs of vegetation?

755. What is a Root? How are roots distinguished from stems?

756. Define the terms tap root, primary, adventitious, multiple, tuberous, and fibrous as applied to roots. Also the terms conical, fusiform, napiform, nodose, and premoise.

757. What is the stem? How are underground stems distinguished from roots?

758. What is a Bud? What are terminal, axillary, adventitious, accessory, and supernumerary buds?

759. Define the terms Annual, Biennial and Perennial. Also the terms herbaceous, fruticose, and arborescent.

760. What name is applied to the peculiar jointed stem of the grasses, as in rye, wheat, and bamboo? What name is applied to the scaly stem of the palms?

761. What is a Rhizome? How does it differ from a root? What is a Tuber? Is it a root or stem? What are Corms and Bulbs? How do they differ from each other?

762. Name an official rhizome, an official tuber and an official bulb.

763. What is a Leaf? What is Vernation? What are the principal kinds of vernation?

764. What is Phyllotaxy? Name the several plans of phyllotaxy.

765. Define the several terms, deciduous, fugacious, cauline, radical, petiolate, stipulate, and sessile, as applied to leaves.

766. What is Venation? Name the several kinds. What are the uses of veins?

767. What is a Simple Leaf? Name several official drugs which are simple leaves.

768. Define the terms, linear, elliptical, oval, lanceolate, oblanceolate, ovate, obovate, spatulate, and orbicular, as applied to the shapes of leaves and leaflets.

769. What is the meaning of the terms obcordate, retuse, aristate, mucronate, cuspidate, truncate, acute, acuminate, and obtuse, as applied to the apexes of leaves?

770. Define the terms serrate, serrulate, dentate, denticulate, crenate, undulate, sinuate, repand, incised, lobed, cleft, parted, and divided, as applied to leaf margins.

771. Name official drugs illustrating some of the above terms.

772. What is a compound leaf? In how many ways may leaves be compounded? Name one or more official drugs consisting of leaflets of compound leaves.

773. What is the meaning of the terms glabrous, glaucous, punctate, glandular, scabrous, pubescent, villose, and hispid, as applied to leaf surfaces.

774. Name official drugs illustrating the preceding terms.

775. Define the terms membranous, succulent, scarious, coriaceous, and herbaceous, as applied to leaf textures.

776. Illustrate the preceding terms by official examples.

777. What are some of the special modifications of leaves?

778. What are the organs of reproduction?

779. What is a Flower? What is meant by Anthotaxy or Inflorescence? What are the two chief varieties? What is a mixed anthotaxy?

780. Describe each of the following kinds of inflorescence: Raceme, Corymb, Umbel, Spike, Catkin, Head, Strobile, and Spadix. Also the Cyme, Glomerule, and Verticillaster.

781. Name official drugs representing as many of the preceding kinds of inflorescence as you can.

782. What is Prefloration or Aestivation? Name the several kinds.

783. What are the parts of a complete flower? What are the offices of the several parts?



784. What is the meaning of the terms regular, irregular, symmetrical, unsymmetrical and incomplete, as applied to flowers?

785. What terms are used to express the adherence or non-adherence of the calyx and ovary?

786. What are the different forms of Corollas? What are the divisions of the corolla called?

787. Describe the different forms of, and the parts of the Stamens. What is meant by the insertion of a stamen? In how many ways may stamens be inserted?

788. Describe the Pollen, its structure and its uses.

789. What is the Pistil? What are its parts? What are the several kinds of ovaries? What is dehiscence and what are the varieties?

790. Describe the processes of Pollination and Fertilization. What are some of the devices of plants to prevent self-fertilization and secure cross-fertilization? What is the effect of proper fertilization?

791. What is a Fruit? Describe the following varieties of fruits: Akene, Utricle, Caryopsis, Samara, Nut, Cremocarp, Drupe, Berry, Hesperidium,

Pepo, Pome, Follicle, Legume, Loment, Cochlea, Capsule, Sorosis, Syconium, Strobile, Galbulus.

792. Name as many examples as you can of the preceding varieties of fruits from official drugs.

793. What is the Seed? Describe the seed coats. What is the hilum? The chalaza?

794. What is an aril or arillode? What official drug is an arillode?

795. What is the essential part of the seed, botanically speaking?

796. Explain the meaning of the terms monocotyledonous, dicotyledonous, polycotyledonous, and acotyledonous.

#### VEGETABLE HISTOLOGY.

797. Describe a typical plant Cell. Is the cell wall an essential part of the cell?

798. Describe the substance called Protoplasm and the part it plays in organic life.

799. What are some of the physiological products which are found in cells?

800. What is Aleurone? What are Crystalloids?

801. What is Chlorophyll, and what part does it serve in the life of the plant? What kind of plants do not contain chlorophyll?

802. What is the chemical composition of Starch? Describe some of the more common varieties.

803. What is Inulin? In what order of plants is it mostly found?

804. Name some of the more common organic acids which occur in plants.

805. What are some of the crystalline bodies which are frequently found in vegetable tissues?

806. Describe the three ways in which the multiplication of cells takes place.

807. Describe the tissues belonging to the Parenchymatous Series, as follows: Parenchyma, Collenchyma, Sclerotic, Epidermal, Endodermal, and Suberous tissues.

808. What tissues belong to the Prosenchymatous Series? What are Libriform cells?

809. What is Vascular Tissue? Describe the following: Dotted, scalariform, spiral, annular, and reticulated ducts. Also bast fibres and sieve tissue. What are Tracheids?

810. What is Laticiferous Tissue, and what office does it perform?

811. Describe briefly the Epidermal, Fibro-vascular, and Fundamental Tissue Systems.

812. What are Fibro-vascular Bundles, and what is their use to the plant? What are the different forms of bundles?

813. The bark of dicotyledons and gymnosperms consists of what layers when all the parts are present?

814. What is Palisade Tissue?

#### VEGETABLE PHYSIOLOGY.

815. What is the average amount of water present in vegetable matter?

816. What is the food of plants and how is it absorbed? What kind of plants can make use of carbon dioxide as food?

817. By what means does the sap of plants ascend, and through what tissues does it rise? What part does osmose play in the ascent of liquids? How may the dissolved gases affect the flow of sap from wounds?

818. What is the function of chlorophyll? Under what circumstances does it exercise this function?

819. What change takes place in starch before it can be conveyed from where it is created in the plant to the point where it is stored or utilized?

820. What is meant by destructive metabolism?

821. What are parasites and saprophytes? Do such plants contain chlorophyll?

822. What is geotropism? What is heliotropism?

823. Describe the means by which plants and cells reproduce themselves.

#### SYSTEMATIC BOTANY.

824. What are the general characteristics of the branch of plants known as the Thallophyta. Describe briefly the Slime Moulds, the Schizophyta, and the Algæ.

825. Can you name any official or unofficial plants belonging to the last class? To what subdivision of this class do they belong?

826. Name the chief characteristics of the class Fungi. Name an official drug representing this class.

827. Describe the class Lichenes, and name an official drug obtained from it.

828. What are the chief characters of the branch Bryophyta?

829. Describe briefly the branch Pteridophyta, and name some official drugs which are obtained from plants of this branch.

830. Give a brief description of the branch Spermaphyta or Phanerogamia, and of its two chief divisions.

831. Name some official drugs which are obtained from each division of the Spermaphyta.

832. Define the terms Order, Genus, Species, Variety.

## PART VIII.

### OFFICIAL MATERIA MEDICA.

REFERENCES :—Same as for Botany and Pharmacognosy. For definition of terms used in describing properties of Plants, see Whelpley's Therapeutic Terms.

833. What is the use of the official title of a drug? In addition to the official Latin title, how many other names may an official vegetable drug have? What is the purpose of more than one name?

834. Describe the drug Absinthium, giving its official title, proper English name, synonym, botanical title, and natural order. Describe its appearance and physical characters. Give its principal constituents, medical properties and dose.

835. Describe Acacia. Is the reaction of the aqueous solution acid, alkaline or neutral? What is its chemical constitution? How do solutions react with basic lead acetate, ferric tartrate and sodium borate? How may adulteration with dextrin be detected?

836. Describe Aconite? Give its habitat, natural origin, and title. What part of the plant is official?

What are the peculiarities of its taste? (Taste cautiously.) What is the dose? What is the name of its principal alkaloid? What is the antidote to poisoning by aconite?

837. Describe the official Lard. What properties should it have? How are alkalies, starch, and chlorides detected when present as impurities? How is the absence of cotton seed oil proved?

838. Describe Hydrous Wool-fat. With what quantity of water may it be mixed? How is the presence of alkalies shown? What are its uses? What are its advantages as an ointment base?

839. Describe the official Garlic. What is its natural origin? In what condition should the drug be used? Into what official preparations does it enter?

840. How many kinds of Aloes are official? From what plant do they originate? How are the official distinguished from the Natal Aloes? What are the properties and dose of the official aloes?

841. Describe the substance known as Aloin. How is it obtained? How may Barbaloin be distinguished from Socaloin? How does aloin react with ferric chloride?

842. Describe Althea. What is its principal constituent? What are its properties? In what official preparations is it used?



843. Describe Ammoniac. To what class of substances does it belong? What are the properties and uses of ammoniac? Into what official preparations does it enter?

844. What is a Gum Resin? What official drugs are gum resins? What is formed when a gum resin is triturated with water?

845. Describe Bitter and Sweet Almonds. Which of these yields hydrocyanic acid when triturated with water? From what does the acid originate? Into what official preparations do they enter? How may bitter and sweet almonds be distinguished from each other?

846. Describe Starch? How does starch jelly react with iodine? Does the reaction occur while the mixture is hot? Describe the microscopic appearance of Corn, Wheat and Potato Starches.

847. Describe Anise. Give its natural origin, habitat and properties. How would you distinguish it from conium fruit?

848. Describe Aspidium. From what two species is the official drug derived? How may they be distinguished? What portion of the drug should be rejected? What preparation is official?

849. Describe Balsam of Peru. What test shows the absence of Gurjun Balsam? What test shows the absence of storax, turpentine and copaiba? How does balsam of peru react with sulphuric acid?

850. Describe Benzoin. What is its natural origin and habitat? What organic acid may be obtained from benzoin by sublimation?

851. Describe Bryonia. Give its natural origin and habitat. How may it be distinguished from calumba? From what two species is the official drug derived?

852. Describe Buchu. Give its natural origin, habitat and name the species from which the official drug may be taken.

853. Describe Calamus. Is the official drug peeled or unpeeled?

854. Describe Calumba. How is it distinguished from bryonia? What are its official preparations?

855. Describe Gamboge. How does its emulsion behave when treated with an alkali, and the alkaline solution when treated with hydrochloric acid? How is the adulteration with starch detected? If starch is present why should the mixture be green instead of blue?

856. Describe Camphor. What are the principal solvents of camphor? With what other solid substances does camphor liquefy when triturated together? How does a fragment of camphor behave when dropped on water perfectly free from grease?

857. How may camphor be powdered? What is the chemical formula for camphor? Into what official compounds does it enter? What is Monobromated Camphor?

858. What are the substances known as Stearoptens? What stearoptens are official?

859. Describe Indian Cannabis. What are its official preparations? What is the dose of the Extract? What are the properties of the drug and its preparations?

860. Describe Cantharides. By what means may its powder be distinguished from a powdered vegetable drug? Name the official preparations. What are its physical properties?

861. Describe Animal Charcoal. Describe the purification of animal charcoal. What per cent. of fixed impurity is allowed? By what means is incomplete carbonization detected? What are the official uses of charcoal? How many varieties of charcoal are official?

862. Describe Cardamom. What are the different varieties found in commerce? Name the official preparations.

863. Describe Cloves. The clove is what part of the plant? What is Mother of Clove? Into what official preparations do cloves enter?

864. Describe Cascarilla. What kind of an odor does it emit when burned? What are its properties and uses?

865. Describe Catechu. Is it a natural or manufactured product? What percentage of the drug should be insoluble in alcohol? How does the diluted tincture react with ferric chloride? What are the official preparations of catechu?

866. Describe White and Yellow Wax. By what tests is the absence of fat, Japan wax, resin and soap proved? How is the presence of paraffine detected? What are the official uses of wax?

867. Describe Chrysarobin and give its natural origin. How does its solution in sulphuric acid react when poured into water? How does it react with potassium or sodium hydrate solution? What is the official use of chrysarobin?

868. Describe Cinchona. What per cent. of quinine and total alkaloids is required? How many va-

rieties of cinchona are official? What cinchona is used to make the compound tincture?

869. What reaction takes place when cinchona in powder is heated in a test tube? By what name is this test commonly known?

870. Describe the three official Cinnamons. Tell how they are distinguished from each other. Into what official preparations do they enter?

871. Describe Coca. How may a valuable be distinguished from an old and valueless drug? What are the official preparations?

872. Describe Colchicum Root and its properties. What is the dose? What is the antidotal treatment when a poisonous dose has been administered? Describe Colchicum Seed. What preparations of colchicum are official?

873. Describe Colocynth. What portion of the drug should be used?

874. Describe Conium. How may it be distinguished from anise seed? How does it react when triturated with a solution of potassium hydrate? What are its physiological properties?

875. What are the substances termed Oleoresins? What natural oleoresins are official?

876. Describe *Copaiba*. Give its natural origin and habitat. Is it a balsam or oleoresin? How is the presence of turpentine and of fixed oils detected?

877. Describe *Saffron*. What part of the plant is it? What drug is commonly sold in place of saffron? From what plant is the latter derived? How are inorganic impurities recognized? How are added coloring matters recognized?

878. Describe *Digitalis*. How old should the plant be from which the drug is collected? What is the reaction of a decoction to litmus paper? How does it react with ferric chloride?

879. What is *Elastica*? In what liquids is it soluble? What is the effect of treating it with sulphur and heat? How may the absence of marked impurities be shown?

880. What is *Elaterinum*? What is its origin and what are its properties? How is it prepared? How does it react with sulphuric acid? With carbolic and nitric acid? How may it be distinguished from alkaloids?

881. Describe *Ergot*. Give its natural origin and properties. How long may the drug be kept? How may it be kept free from insects? How may an old

and worthless drug be distinguished from a fresh and valuable specimen?

882. Describe *Eriodictyon*. What is the principal use made of the fluid extract?

883. Describe *Eucalyptus*. What are the principal properties of *Eucalyptol*? How can the presence of phenol be shown?

884. Describe *Fig*. What part of the plant is it? What percentage of sugar does it contain? What kind of sugar? What is the official use of fig?

885. Describe *Frangula*. How old should the drug be before being used? Why?

886. Describe *Nutgall*. What variety of the drug should be rejected? What is the principal constituent of nutgall? How do preparations of nutgall react with preparations of iron?

887. Describe *Glycyrrhiza* and its official preparations. What is *Glycyrrhizin*? What is the object of the *Water of Ammonia* used in preparations of *glycyrrhiza*? What would be the effect of fixed alkalis or acids on preparations containing *glycyrrhizin*?

888. Describe *Purified Cotton*. What are the evidences of proper purification? What per cent. of ash

should it yield? What are the uses of purified cotton?

889. Describe Guaiacum Wood. Is it heavier or lighter than water? What odor does it emit when heated? How does it react with nitric acid?

890. What is Guaiac? How does its alcoholic solution behave when treated with ferric chloride? Into what official preparations does it enter?

891. What is Guarana? What is its botanical origin? Is it a natural or an artificial product? What is its chief constituent? What are its properties? What other common substances contain the same principle?

892. Describe Hops. What part of the plant is it? What is its important constituent? What other official drug is obtained from the same plant? What are the properties of the plant?

893. Describe Hyoscyamus. From what plant should the drug be taken? What are its properties and principal constituents? What are the official preparations? What are the antidotes to poisoning by hyoscyamus?

894. What is Isinglass? What are its official uses? What is the substance which is used for windows in stoves and which is often improperly called isinglass?



895. Describe *Illicium*. What is its principal constituent? How may the official drug be distinguished from the poisonous *Illicium anisatum*?

896. Describe *Inula*. What substance in this plant and others of the same family takes the place of starch?

897. Describe *Ipecac*. What has the thickness of bark and wood to do with determining the quality of the drug? Why? What are the official preparations? What is the principal constituent of the drug?

898. Describe *Juglans*. What part of the plant is official? When should it be collected? What are its properties? What preparations are official?

899. Describe *Kamala*. What part of the plant is it? What is its appearance under the microscope? What are its properties? What per cent. of ash should it yield?

900. Describe *Kino*. What change frequently takes place in tincture of kino on standing? How is this explained? How may it be prevented?

901. Describe *Krameria*. What plant yields the official drug? What are the official preparations?

902. Describe *Lactucarium*. Give its botanical origin. Is it a natural or manufactured product?

How is the adulteration with starch detected? What are the properties and dose?

903. Describe Linseed. What kind of linseed is used for medicinal purposes? What per cent. of fixed oil should it yield?

904. Give the natural order and habitat of Lobelia. What part is official? When should it be collected? What are the properties of lobelia? What is the antidote?

905. Describe Lupulin. How is the adulteration with sand and similar substances detected? What per cent. of ash is allowed? What is its microscopic appearance? What are its properties?

906. Describe Lycopodium. What is its appearance under the microscope? What is the allowable per cent. of ash? How are impurities and adulterations best detected?

907. What takes place when flame is brought in contact with a cloud of lycopodium floating in the air? What are the pharmaceutical uses of lycopodium?

908. What is the official Manna? What is its principal constituent? What is its chemical constitution? Of what preparation is it a constituent? What are its properties?

909. Give the natural origin, habitat and pharmacopœial title of Matico. How may matico be distinguished from digitalis leaves? What are its properties?

910. Describe Menthol. What is its chemical character, and from what sources is it obtained? What are the best solvents of menthol? With what solid substances does it liquefy when they are triturated together?

911. What is the effect of menthol on polarized light? How are wax and paraffine detected in menthol? How is the presence of thymol proved?

912. Describe Mezerium. What is its natural origin? Into what official preparations does it enter? What are its properties?

913. Describe Musk, and give its natural origin. How does it behave when ignited with free access of air?

914. Describe Nutmeg, its constituents and properties. What are its official uses? What other official drug is obtained from the same plant?

915. Describe Myrrh. What is the reaction of its tincture with nitric acid? What varieties of the drug should be rejected? What are the official prep-

arations? What will occur when the tincture is mixed with water?

916. Describe *Nux Vomica*. What are its constituents? What are the official preparations? What are the properties of the drug?

917. What are the antidotes to poisoning by *nux vomica*? What are the symptoms of strychnine poisoning?

918. Describe *Opium*, its origin and habitat. How many forms of the drug are official? How many alkaloids does it contain? What per cent. of morphine should it yield?

919. What is *Opium Deodoratum*? How is it prepared?

920. What is *Pancreatin*? What is its action on albuminoids and on starch? What is its reaction on milk? How does the medium in which it acts differ from the medium in which pepsin acts?

921. Describe *Pareira*, giving its natural origin, habitat, and properties. What varieties of the drug should be rejected? What is the official preparation?

922. Describe *Pumpkin Seed*. What is the principal use made of this drug? How would you prepare an emulsion of pumpkin seed?

923. Describe Pepsin. What characters should an official article possess? What quantity of albumin should it be capable of dissolving? How is the value of pepsin determined?

924. Describe Physostigma. What are its principal constituents and their properties? What are the antidotes to poisoning by physostigma? What are the official preparations?

925. Describe Phytolacca fruit and root, their properties and official preparations.

926. Describe Pilocarpus and its alkaloids. What are their properties and uses?

927. Describe Burgundy Pitch. What are some solvents of burgundy pitch? What are its properties and uses?

928. Describe Wild Cherry. When should it be collected? What odor is developed on maceration in water? To what is this due? What variety of the drug should be rejected? Why is this drug called "Prunus Virginiana"? What are the official preparations?

929. Describe Pulsatilla. From what plant is the drug obtained? When should it be collected? How long may the drug be kept?

930. Describe Quassia and its official preparations. What are the constituents of quassia, and what are their properties?

931. How many official drugs are obtained from the natural order Rosacea? Which of these are barks? Which are flowers or parts of flowers? Which are roots or parts of roots?

932. Describe Quillaja. What gave the drug the name of Soap Bark? What is the principal constituent? What are the properties of the drug?

933. Describe Rhubarb. What gives to rhubarb its grittiness when chewed?

934. What varieties of rhubarb should be rejected? What are the characters of a good sample of rhubarb? What are the principal constituents? What are the principal preparations of rhubarb?

935. Describe Rhus Toxicodendron. What harmless plants of similar appearance are frequently mistaken for this plant?

936. Describe Red and Pale Rose, and their official uses.

937. Describe Rubus. What part of the plant is official? What species yield the official drug?

938. Describe Raspberry. What part of the plant is official?

939. Describe Red Saunders. What are the principal uses of this substance? Is the coloring matter of red saunders soluble in water?

940. Describe Santonica. How would you distinguish this drug from chenopodium? What is the essential constituent of santonica?

941. What is a characteristic reaction of santoin? Does it ever act poisonously when used as a medicine? How should it be preserved?

942. Describe Sassafras and Sassafras Pith. How does a mucilage of sassafras differ from a mucilage of acacia?

943. Describe Scammony. How is adulteration with starch detected? What percentage should be soluble in ether? What is the important constituent?

944. Describe Senna. What plants yield the official drug? What adulterations are frequently present? What are the principal constituents? What portions of the drug should be rejected? What are the official preparations?

945. Describe *Serpentaria*. What plants yield the official drug? How may the two varieties of drug be distinguished from each other?

946. Describe White and Black Mustards. Which variety is used for making mustard paper? What is the active principle of mustard? Does it exist naturally in the drug or is it the result of a chemical process?

947. Describe *Spigelia*. With the root of what other plant is this drug sometimes confounded, and how are they to be distinguished? What are the uses of *spigelia*? Does it ever act poisonously? How is such an action prevented?

948. Describe *Stramonium* Leaves and Seed, their properties and preparations. What is the active constituent?

949. Describe *Styrax*. What percentage should be soluble in alcohol? What are the principal constituents of *styrax*? Does it belong to the class of balsams?

950. Describe *Tamarind*. What part of the plant is it? How is the absence of copper detected? What are the official uses of *tamarind*?

951. Describe *Taraxacum*. With what other root is it frequently adulterated? When should it be collected?



952. What are the substances which are called Terpenes? What official substances belong to this class? Describe Turpentine, and Canada Turpentine.

953. Describe Thymol and its origin. With what substances does it liquefy when triturated with them? How may adulteration with paraffine, spermaceti and similar substances be detected?

954. What is the reaction of thymol when dissolved in glacial acetic acid, and treated with sulphuric and nitric acid?

955. Describe Tragacanth, and give its origin and habitat. How does tragacanth behave when treated with water? How does it differ from acacia?

956. Describe Triticum. When should the drug be collected? What is the best solvent for its active principle?

957. Describe Vanilla. What is the crystalline substance frequently seen on the outside of vanilla beans?

958. Describe Veratrum Viride, its properties and official preparations.

959. Describe Ginger and its properties. What is its principal constituent? Name its official prepa-

rations. What is the character of the menstruum used in exhausting ginger? Why?

960. What official drugs are obtained from the natural order Caprifoliaceæ? Of these which are barks, and which are flowers?

961. What official drugs result from the sting of an insect?

962. What official drugs are obtained from the natural order Celastraceæ?

963. What official drugs are obtained from the animal kingdom or through the agency of animal life?

964. What official drugs consist of whole insects?

965. What official drugs consist of a portion only of the animal body, or of a single tissue?

966. What official drugs consist of substances secreted by the digestive organs of Mammalia?

967. What official fatty substance or substances are collected and stored by members of the class Insecta?

968. What official fatty or oily substances are obtained from members of the class Pisces?

969. What official fatty substances are obtained from the tissues of members of the class Mammalia?

970. What official saccharine substance is obtained from a member of the class Mammalia? What saccharine substance is secreted by a member of the class Insecta?

971. What official drugs are obtained from the class Fungi?

972. What official drugs are obtained from the class Lichenes?

973. What official drugs are obtained from the class Algæ?

974. What official drugs belong to the class of substances known as Balsams? What is a true balsam? What natural oleoresin is commonly called a balsam?

975. How many official drugs are produced by the natural order Labiatae? Name some of the principal ones. What are the usual constituents of the drugs of this order?

976. What are the four chief kinds of Sarsaparilla which are found in the market? Which of them belong to the "mealy" and which to the "non-mealy"

varieties? What portions of the crude drug should be rejected?

977. What are the medicinal uses of sarsaparilla? What is the nature of its active constituent?

978. What peculiar feature of Senega enables it to be distinguished from a spurious drug? What are the properties and dose of the drug?

979. What principles in Gentian yield a dark color when preparations of the drug are combined with iron compounds?

980. What botanical order of plants furnishes the greatest number of official drugs?

981. Describe the drug *Calendula*, and give its botanical origin. What are the properties and dose?

982. Describe *Chenopodium*, give its habitat and botanical origin. With what other "Wormseed" is this drug sometimes confounded? What is the active principle of *chenopodium*? What are the properties and dose?

983. What are the official titles and botanical names of Wormwood, Chamomile, Pleurisy Root, Male Fern, Deadly Nightshade, Sweet Flag, Marigold, Cayenne Pepper, Chestnut, Blue Cohosh, Black Cohosh, Black Snake-root, Lily of the Valley, Ladies'

Slipper, Foxglove, Bittersweet, Yerba Santa, and Wahoo?

984. What two species of plants constitute the official *Grindelia*? What part of the plant is employed?

985. What are the chief constituents of the drug *Asafetida*? Into what official preparations does it enter?

986. What portions of the *Arnica montana* are official? What are the official preparations of each? What is the difference in strength?

987. What are the official titles and botanical origin of the drug commonly known as *Pleurisy Root*? What change takes place in the drug on keeping?

988. What are the principal characters of the drug *Aspidosperma*? What is its botanical origin, and what are its constituents?

989. What two kinds of *Orange Peel* are official? What is the chemical constitution of oil of orange?

990. Give the official characters of *Capsicum*. What is its chief constituent? In what portion of the drug is it most abundant? Does *capsicum* possess the narcotic properties usually possessed by other members of the same natural order?

991. What are the official characters and uses of *Cassia Fistula*?

992. In the case of the following drugs, what parts of the plants are official: *Calendula*, *Ergot*, *Eucalyptus*, *Guarana*, *Hamamelis*, *Juglans*, *Lupulin*, *Rhus Glabra* and *Toxicodendron*, *Rubus* and *Rubus Idaeus*, *Sassafras*, and *Stramonium*?

993. When should the following drugs be collected: *Castanea*, *Euonymus*, *Hamamelis*, *Juglans*, *Lobelia*, *Sanguinaria*, *Taraxacum*, *Triticum*?

994. Describe *Podophyllum*, its constituents and properties. What is the substance known and used under the name of *Podophyllin*?

995. To what order of plants does *Cetraria* belong? What is its habitat? What are its principal constituents? What are its medical properties? What impurities are frequently mixed with the drug?

996. What are the official characters of *Chelidonium*? For what is the drug used medicinally?

997. Describe *Chimaphila*, its constituents and uses.

998. What is the official part of *Chirata*? What plant is sometimes substituted for it? How may the

substitution be detected? What are the constituents and medical properties of *chirata*?

999. What is the botanical origin of *Chondrus*? How do the official species differ? How does its cooled decoction with water react with Iodine? What are its constituents and properties?

1000. Describe *Cimicifuga* and its uses.

1001. Describe *Convallaria*. How does its medicinal action differ from that of *digitalis*?

1002. What four official drugs are derived from the natural order *Piperaceæ*? Give a brief description of each.

1003. What official drugs are derived from the order *Orchideæ*?

1004. Describe *Cusso*, its constituents and uses.

1005. What official drugs consist of the woody parts of the plant, and are found in commerce as billets, chips, shavings, raspings, or coarsely ground powder?

1006. Give a brief description of each, its constituents and use.

1007. What two official drugs are obtained from the *Convolvulaceæ*? What per cent. of resin should they contain? What are their properties and doses?

1008. What is Honey? In what forms is it official? What are common adulterations? How are glucose and starch detected?

1009. What official drugs consist of twigs? Give a brief description of each.

1010. What official drugs are obtained from the order *Solanaceæ*? Give the botanical name and principal constituents of each. What properties characterize nearly all the plants of this order?

1011. What official drugs are obtained from the order *Apocynaceæ*? What are the characteristic properties of the order?

1012. What official drugs are obtained from the order *Euphorbiaceæ*? What properties characterize plants of this order? What would be a poisonous dose of *Croton* oil? A medicinal dose?

1013. Describe the drugs which are obtained from the *Cucurbitaceæ*.

1014. What official drugs consist of the stigmas of plants?



1015. Describe the official drugs obtained from the order Ranunculaceæ. How many of these may be considered as decidedly poisonous?

1016. What valuable official drugs are obtained from the Rubiaceæ?

1017. Describe the official drugs obtained from the Scrophulariaceæ.

## PART IX.

### PRESCRIPTIONS, DISPENSING, INCOMPATIBILITIES, MICROSCOPY, AND MISCELLANEOUS.

REFERENCES:—Scoville, Art of Compounding; for Prescriptions see Wall's The Prescription; for other subjects see authorities cited for preceding sections. Also "The Pharmacist at Work," a series of papers by W. C. Alpers in *Merck's Bulletin* for 1895-'96.

#### PRESCRIPTIONS.

1018. What is the probable origin of the sign  $\mathcal{R}$ ? What is its meaning?

1019. What are the parts of a correctly written prescription?

1020. Define and name the offices of each of the following parts of the inscription: Basis, Auxiliary, Corrective, Vehicle or Diluent.

1021. Why is Latin to be preferred as the language of prescriptions?

1022. What should be the case endings of the substances named in the inscription? What should be the case endings of the quantities?

1023. What are the meanings of the abbreviations ss., aa., ad., q. s., m. ft., q. l. and sig.?

1024. Why is it of importance that the name of the patient be written upon the prescription?

1025. A recipe, after ordering certain vegetable drugs, directs that a *species* be made of the mixture. What is meant by the direction?

1026. In writing quantities in the apothecaries' and metric systems, what is the difference in the kind of numerals employed and the difference in their positions?

1027. What are the meanings of the terms *cum*, *in*, *et*, *ana*, *adde*, *fiat* or *fiant*, *detur*, *dentur*, *solve*, *tere*, *secundum artem*?

1028. What are the principal rules for abbreviating in prescriptions?

1029. What is the meaning of "P" or "P. P" when written upon a prescription?

1030. What is Young's Rule for determining the dose of a medicine for a child?

1031. Expand and interpret the following: M. et

ft. emuls.; M. et ft .pil. No. XX.; R̄ Liq. Magn. Citr., lagenam i; D. tal. pil. XX.; M. d. in vitro.; M. et divide in pilulas XXIV.

#### DISPENSING.

1032. What poisonous mineral compound, having a slightly similar official title, has sometimes been dispensed by mistake for Sodii et Potassii Tartras? What would be the consequences probably following such an error?

1033. What substance should be dispensed when "Solution of Persulphate of Iron" is ordered by the physician?

1034. What is the best method of dissolving scaled salts rapidly when these are required to be dispensed in prescriptions?

1035. How should a mixture be dispensed which contains quinine and tannin?

1036. In preparing the mixture known as "black wash," what would be the fault of merely shaking the calomel with the lime water instead of triturating the substances together?

1037. How many grains of quinine sulphate can be dispensed from an ounce bottle of the substance? How many grains of morphine sulphate from an eighth ounce bottle?

1038. What would be the objection to the use of an iron or steel spatula in compounding prescriptions containing carbolic or salicylic acid or their compounds?

1039. A prescription for pills orders that they be coated with tolu; how shall the operation be performed? How could they be coated with gelatin?

1040. What is pearl-coating and how applied? How are pills coated with Keratin? With Salol? What is the object of the last two coatings?

1041. When alcoholic liquids are to be combined with a mixture containing an emulsion, at what stage of the operation should they be added?

1042. When alcoholic preparations of a resinous drug are required to be mixed with aqueous liquids, what generally ensues? How may the difficulty in many cases be avoided or at least partially obviated?

1043. What precautions should be observed in combining a vegetable extract with a fatty base in making an ointment?

#### INCOMPATIBILITY.

1044. What is the meaning of the term incompatibility? What is its pharmaceutical application?

1045. Into what classes of cases is incompatibility usually divided? What distinctions are commonly made between chemical, pharmaceutical and therapeutic incompatibility?

1046. A recipe for tooth powder orders, among other things, charcoal and potassium chlorate; should it be dispensed? Why?

1047. What chemical decomposition would follow the mixing of chloral hydrate with Liq. Potassæ or Liq. Sodæ?

1048. What dangerously explosive compound may be produced by the trituration of a small quantity of glycerin with certain metallic nitrates, such as bismuth subnitrate?

1049. What would be the probable result of attempting to combine chromic acid with ether, glycerin, sugar, alcohol or other similar substances?

1050. What reaction will take place when an iodide and a ferric salt are brought together in solution? Should such a mixture be dispensed, if intended for internal use?

1051. What would be the result of bringing together in the same mixture albumin or albuminous compounds and salts of the heavy metals, as mercuric chloride?

1052. What reaction occurs when chloral, along with alcohol or alcoholic liquids, is brought into combination with certain alkaline salts, as sodium or potassium bromides or chlorides?

1053. What would occur in bringing together mercuric chloride and strychnine in solution? Should such a mixture be dispensed? Why?

1054. What reaction will take place when fluid extracts or tinctures containing tannin are brought into combination with spirit of nitrous ether?

1055. What reaction would take place on triturating together calomel and potassium bromide? Should the mixture be dispensed?

1056. What change will gradually take place in pills containing bismuth subnitrate and sodium bicarbonate?

1057. What are some of the substances most likely to precipitate alkaloids from solution when combined with preparations containing the latter substances?

1058. How should such mixtures be dispensed, if the alkaloid is not poisonous? If the alkaloid is of a poisonous character, should the mixture be dispensed?

1059. What is the common character possessed by the chlorates, permanganates, nitrates, nitric acid, chromic acid, silver oxide, and similar substances which renders it dangerous to combine or triturate them, especially in the dry state, with easily oxidizable or combustible substances?

1060. What very poisonous substance may result from the combination of chloroform with free ammonia?

1061. A recipe calls for nitric and sulphuric acids together with oil of turpentine, what precautions should be observed in the mixing?

### MICROSCOPY.

REFERENCES:—Clark's Practical Methods in Microscopy; Gage, Microscopical Methods; Stokes, Microscopical Praxis; Carpenter, The Microscope and Its Revelations, etc.

1062. What is the Undulatory theory of Light?

1063. What is the difference between Refraction and Dispersion of Light?

1064. What is meant by Index of Refraction? What is the difference between the Absolute and the Relative Index of Refraction, and how is the latter determined from the former?



1065. What is meant by "Total Reflection" and "Critical Angle"?

1066. What is a Double Convex Lens? How is it related to the triangular prism?

1067. What is Spherical Aberration, and how corrected?

1068. What means are used to overcome the Dispersion of convex lenses?

1069. What is a simple Microscope?

1070. What arrangement of lenses constitutes a Compound Microscope?

1071. What are all the parts of a complete Compound Microscope?

1072. What is the difference in the structure and use of the objective and the eye piece?

1073. What is the purpose of the cover-glass? How are objectives corrected for cover-glass thickness?

1074. What is an immersion objective? What are its advantages over a dry objective?

1075. What is meant by the Angular Aperture of an objective?

1076. What is Numerical Aperture, and how calculated from Angular Aperture?

1077. What is the structure and use of the Sub-stage Condenser?

1078. By what means are objects measured under the microscope? What is the unit of measurement?

1079. What is a common form of Camera Lucida, and how is it used?

1080. What is a Nicol Prism, and what effect does it have upon a ray of light passed through it?

1081. How is this property of the Nicol prism utilized in the construction of the Polarizer?

1082. What are the uses of Polarized light in Microscopy?

1083. How would you proceed to "illuminate the field" of the microscope? What is the difference between central and oblique illumination?

1084. In bringing the objective down to the object, should you look through the instrument, or watch the end of the objective? Why?

1085. How would you illuminate and examine an opaque object?

1086. What is the so-called Brownian Movement or Pedesis?

1087. How do you identify oil and air bubbles?

1088. How would you prepare and examine a section of growing vegetable tissue? If the tissue should be very soft, how could it be hardened for sectioning?

1089. What are the most efficient forms of section instruments?

1090. How would you prepare a section of hard vegetable tissue, as a dry root or stem?

1091. What crystals are most common in plant cells?

1092. What is the object of imbedding, and what are several forms of the process?

1093. What would be the manipulation pursued in examining a dry vegetable powder?

1094. By what means would you recognize starch grains, or cellulose under the microscope?

1095. What are the microscopic characters of Bean, Potato, Wheat, Corn, and Rice starches?

1096. What is the object of staining preparations for the microscope? What are some common stains?

1097. How are Balsam Mounts prepared? Describe the processes of Dehydration and Clearing.

1098. How are objects mounted in Glycerin Jelly? How are dry mounts prepared?

1099. What are some of the methods of Finishing Slides?

1100. What is a Turn Table, and how used?

### MISCELLANEOUS QUESTIONS.

REFERENCES: — Authorities previously cited.

1101. In making a percentage solution should the solvent be taken by weight or by measure? What would be the proportions of the ingredients for a one per cent. solution of cocaine hydrochlorate? What would be the proportions for one fluidounce of solution of morphine sulphate four per cent.?

1102. What are the official rules for the dilution of alcohol to any required strength, either by weight or by volume?

1103. What are granular effervescent salts and how are they prepared?

1104. What substances are employed to form the neutral base or diluent of tablets intended for hypodermic solutions?

1105. The dose of a medicine when administered hypodermically is about what proportion of the dose when administered by the mouth? When administered as an enema or in a suppository, what proportion of the dose by the mouth may be given?

1106. In preparing the oleate of an alkaloid, should the free alkaloid be used or one of its salts?

1107. What are the Oleosaccharates and how are they made?

1108. Describe the preparation of Compressed Tablets. Should the substance be granular or in fine powder? What occasions sticking to the dies?

1109. What is the cause of the "capping" of compressed tablets and how may it be prevented? What is the purpose of a "lubricant"? What substances are used as lubricants? How may tablets be made from fluid extracts?

1110. What is the official antidote for arsenical poisoning and how is it prepared? Will the prepared antidote keep for use or must it be freshly made? What advantage, if any, does the antidote prepared with magnesia possess over that made with ammonia water?

1111. What compound is formed when the antidote and the arsenic come together in the stomach?

Why is it necessary that the new compound be removed from the stomach, either by emetics or by the stomach pump?

1112. Why is Tincture of Ferric Chloride directed to stand for three months before using?

1113. What is the purpose of the alcohol used in making granulated ferrous sulphate?

1114. What is the so-called "colorless tincture of iodine"? Does it really contain iodine as such or in the form of a compound?

1115. What is the character of the scale compounds of the Pharmacopœia? Are they generally definite compounds? How many scale compounds are official? What is the purpose of the ammonia which is contained in several of the compounds?

1116. What are Basham's and Griffith's Mixtures? Under what names are they official? Are they permanent preparations?

1117. What are the tests for distinguishing between carbolic acid and creosote?

1118. How may gallic and tannic acids be distinguished from each other? Bismuth subnitrate and calomel?

1119. Does the U. S. Pharmacopœia recognize the compound microscope as an instrument of pharmaceutical use? If so, in what cases? In what cases does it recognize the simple microscope?

1120. What are the average adult doses of the sulphates of morphine, strychnine and atropine?

1121. Is it proper to keep tincture of ferric chloride exposed to the light?

1122. How is mercuric chloride detected as an impurity in calomel?

1123. What is kermes mineral, and how is it prepared?

1124. What change takes place in the olein of the lard oil employed in making citrine ointment?

1125. What are the impurities commonly found in commercial sulphuric acid?

1126. What is the chemical composition of the substance prescribed and used under the name of sub-carbonate of iron? Does it contain any carbonate?

1127. In preparing the scaled salts of iron, what faulty condition of the product will result from the presence of too great a quantity of citric acid?

1128. What difference is shown by the light and the heavy variety of magnesia as to the property of gelatinizing when mixed with fifteen times their weights of water? Which variety should be used in making mass of copaiba?

1129. Why is the bicarbonate of potassium so frequently preferred to the normal or monocarbonate in making official preparations?

1130. In preparing ferric hydrate, should the solution of the ferric salt be added to the water of ammonia, or vice versa? Why?

1131. What are the substances which are used by "Eclectic" practitioners under the name of resins?

1132. Which keep better, cerates made with white or with yellow wax? Why?













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